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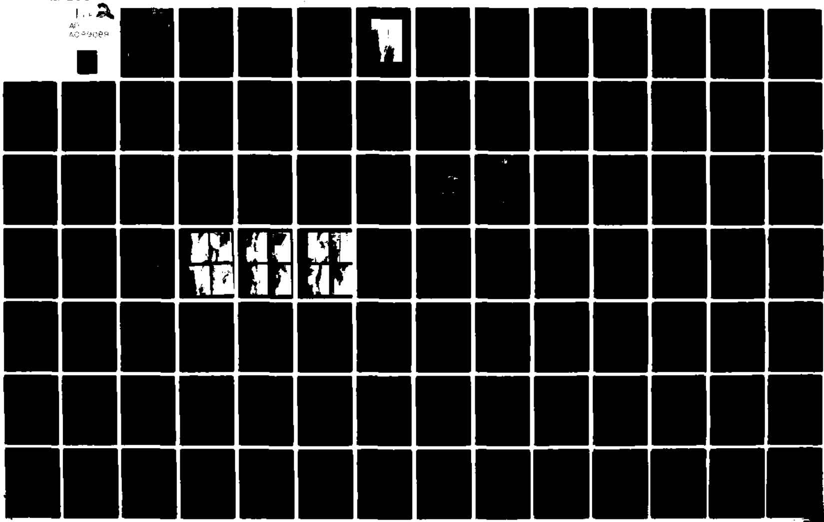

LEVEL II

AD A099 089

DELAWARE RIVER BASIN
DINGMANS CREEK, PIKE COUNTY

PENNSYLVANIA

BEAVER POND DAM

NDI I.D. NO. PA-00408
PENNDER I.D. NO. 52-13

~~ECKMAN LUMBER COMPANY~~

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.

(6) Beaver Pond Dam (NDI I.D. ... PA-00408, Penn DER I.D. Number 52-13) Delaware River Basin, Dingmans Creek, Pike County, Pennsylvania. Phase I Inspection Report

PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(15) DACW31-...

PREPARED BY

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Beaver Pond Dam: NDI I. D. No. PA-00408

Owner:	Eckman Lumber Company
State Located:	Pennsylvania (PennDER I.D. No. 52-13)
County Located:	Pike
Stream:	Dingmans Creek
Inspection Date:	13 November 1980
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and hydrologic/hydraulic analysis, the dam is considered to be in good condition.

The size classification of the facility is small and the hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of hydrologic and hydraulic analyses indicate the facility will pass and/or store approximately 40 percent of the PMF prior to embankment overtopping at the low area in the embankment crest (elevation 1177.4). Breach analysis indicates that failure under less than 1/2 PMF conditions could lead to increased downstream damage and potential for loss of life. Thus, based on screening criteria provided by the recommended guidelines, the spillway is considered to be seriously inadequate and the facility unsafe, non-emergency.

It is recommended that the owner immediately:

a. Develop a formal emergency warning system to notify downstream residents should hazardous embankment conditions develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

b. Retain the services of a registered professional engineer experienced in the hydraulics and hydrology of dams to more accurately assess the adequacy of the spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

Beaver Pond Dam: NDI I.D. No. PA-00408

c. Have the embankment and adjacent abutment areas accurately surveyed and infill any low areas to restore the crest to the design elevation of 1177.5 feet.

d. Repair all areas of deterioration in the concrete surfaces of the spillway and spillway apron, and rearrange any displaced riprap in the discharge channel.

e. Remove the potentially obstructing debris lodged in the spillway forebay.

f. Remove all the trees, their root systems, and brush from the crest, upstream and downstream embankment slopes. This operation should be conducted under the guidance of a soils engineer experienced in the design and construction of earth dams.

g. Develop formal manuals of operation and maintenance to ensure the future proper care of the facility.

GAI Consultants, Inc.

Bernard M. Mihalcin, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
BERNARD M. MIHALCIN
ENGINEER
20371-E

Date 30 March 1981

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date 15 APR 81

OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
BEAVER POND DAM
NDI # PA-00408, PENNDER # 52-13

SECTION I
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Beaver Pond Dam is an earth embankment approximately 14 feet high and 395 feet long, including spillway. The facility is provided with an uncontrolled, rectangular shaped, concrete chute channel spillway located at the right abutment. The spillway is equipped with an ogee-type weir, 110 feet in length. The outlet works consist of a 36-inch diameter reinforced concrete pipe that discharges at the downstream embankment toe near the left sidewall of the spillway. Flow through the pipe is manually controlled by a 36-inch diameter sluice gate located at the inlet.

b. Location. Beaver Pond Dam is located on Dingmans Creek in Delaware Township, Pike County, Pennsylvania. The facility is located approximately two miles east of the community of Edgemere, Pennsylvania, and less than three miles northwest of the town of Holy Trinity (off Legislative Route 51006). The dam reservoir and watershed are contained within the Edgemere and Lake Maskenozha, Pennsylvania-New Jersey, 7.5 minute U.S.G.S. topographic quadrangles (see Figure 1, Appendix E). The coordinates of the dam are N41° 15.1' and W74° 56.9'.

c. Size Classification. Small (14 feet high, approximately 150 acre-feet storage capacity at the top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Eckman Lumber Company
R. D. #3
Lehighton, Pennsylvania 18235

Attention: John Eckman, President

f. Purpose. Recreation.

g. Historical Data. Detailed correspondence from PennDER files indicate that Beaver Pond Dam was originally constructed prior to 1913 and was used for water power. The original dam was an earth and rock structure 10 feet high and only 70 feet long. By 1950, remedial measures to control seepage and correct damage from overtopping had resulted in a facility with a concrete spillway and an embankment length of about 200 feet. During the flood of August 1955, however, the dam was once again severely damaged and it was decided by the owner to reconstruct the entire facility.

In 1955, Edward C. Hess Associates, Inc., civil engineers of Stroudsburg, Pennsylvania, designed the present facility. The new dam was designed as a 350-foot long earth embankment (field measured at 395 feet) with a 110-foot concrete spillway. This facility was completed in 1956-1957 and has since functioned without any significant problems.

1.3 Pertinent Data.

a. Drainage Area (square miles). 7.0

b. Discharge at Dam Site

Discharge Capacity of Outlet Conduit - Discharge curves are not available.

Discharge Capacity of Spillway at Maximum Pool ≅ 5100 cfs (see Appendix D, Sheet 10).

c. Elevations (feet above mean sea Level). The following elevations were obtained from available drawings and through field measurements based on the elevation of normal pool at approximately 1172.0 feet as indicated in Figure 1 (see Appendix D, Sheet 1).

Top of Dam	1177.5 (design).
	1177.4 (field).
Maximum Design Pool	Not known.
Maximum Pool of Record	Not known.
Normal Pool	1172.0 (assumed datum).
Spillway Crest	1172.0.
Upstream Inlet Invert	1165.0 (design).
Downstream Outlet Invert	1164.6 (design).
Downstream Outlet Invert	1163.1 (field).
Streambed at Dam Centerline	1164.6 (estimated).
Maximum Tailwater	Not known.

d. Reservoir Length (feet).

Top of Dam	2650
Normal Pool	2500

e. <u>Storage (acre-feet)</u>.

Top of Dam	150
Normal Pool	61

f. <u>Reservoir Surface (acres)</u>.

Top of Dam	20
Normal Pool	13

g. <u>Dam</u>.

Type	Earth.
Length	285 feet (excluding spillway).
Height	14 feet (field measured; embankment crest to downstream embankment toe).
Top Width	Varies; two feet minimum at left abutment to 10 feet maximum near spillway.
Upstream Slope	2H:1V.
Downstream Slope	Varies; 6.5H:1V minimum to 3H:1V maximum.
Zoning	Homogeneous earth embankment with a rock covered upstream slope (see Figure 3).
Impervious Core	Homogeneous earth section.
Cutoff	Impervious cutoff as shown in Figure 3.
Grout Curtain	Not known.

h. <u>Diversion Canal and Regulating Tunnels.</u> None.

i. <u>Outlet Works</u>.

Type	Concrete intake tower with Rodney Hunt Series 208 rising stem operator and 36-inch diameter sluice gate.

Outlet Conduit	36-inch diameter reinforced concrete pipe encased in concrete.
Conduit Length	55 feet, sluice gate to outlet endwall.

j. Spillway.

Type	Uncontrolled, rectangular shaped, concrete chute channel with an ogee-type weir.
Crest Elevation	1172.0 feet.
Crest Length	110 feet.
Closure and Regulating Facilities	Manually controlled upstream of embankment centerline via 36-inch diameter sluice gate located at the inlet. The gate is housed at the base of a reinforced concrete riser situated along the upstream embankment toe.
Access	The riser is not accessible by foot from the embankment crest.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources. No formal design reports or calculations are available. No information pertaining to the design of the original dam is available in the PennDER files; but, information about the present facility is contained in the above files in the form of two drawings, dated 1955 (see Figures 2 and 3, Appendix E). In addition, these files contain the state construction permit application reports, dated 1955 and 1956, which contain brief descriptions of the design aspects of the present facility.

b. Design Features.

1. Embankment. Details of the basic embankment design are presented in Figures 2 and 3. As indicated, the present facility was constructed atop the existing earth embankment (see Figure 3, Section E-E). Specific design features are obscure since much of the embankment, as viewed by the inspection team, differed somewhat, in dimension and cross-section from that shown in Figure 3. The renovated embankment constructed in 1956, was designed with 2H:1V upstream and downstream slopes and an eight-foot minimum embankment crest width. The embankment crest, observed by the inspection team, varied in width from ten feet near the left spillway sidewall to two feet near the left abutment. The downstream face has an irregular slope varying from 6.5H:1V to 3H:1V. The steepest downstream embankment slope coincides with the broadest section of the embankment crest near the left sidewall of the spillway. An impervious clay cutoff is apparent in the available drawings and is discussed in the state permit reports.

2. Appurtenant Structures.

a) Spillway. Design features of the spillway are presented in Figures 2 and 3. As indicated, the spillway is an uncontrolled, rectangular shaped, concrete chute channel with an ogee-type weir located at the right abutment. The length of the spillway crest is 110 feet. The structure is tied into the embankment on both sides with 18-inch thick concrete key walls that are reportedly carried to impervious foundation material. The spillway was designed to discharge over a 12-inch thick grouted stone apron. At the end of the apron, an 18-inch thick curtain wall is carried down to a suitable impervious foundation material. The discharge channel downstream of the curtain wall was to be protected with randomly dumped stone.

b) Outlet Conduit. Design features of the outlet conduit are presented in Figure 3. As indicated, the outlet conduit is a 36-inch diameter reinforced concrete pipe with the inlet

located at the base of the reinforced concrete riser and the outlet at the downstream toe of the embankment immediately adjacent the left sidewall of the spillway. The concrete riser is situated on the upstream side of the embankment adjacent to the spillway. Flow through the outlet is controlled by means of a 36-inch diameter sluice gate located at the inlet. The gate is manually operated from atop the riser structure.

c. Specific Design Data and Criteria. Available design data is limited primarily to the information contained in the 1955 and 1956 state permit application reports and provided in Figures 2 and 3. No information relative to specific design procedures or applied construction techniques was obtained.

2.2 Construction Records.

No formal construction records are available for the original facility built prior to 1913, or for the present facility built in 1956-1957. PennDER files contain photographs and correspondence accumulated during the years of construction; however, there is no information pertaining to specific construction aspects or techniques such as compaction procedures.

2.3 Operational Records.

No records of the day-to-day operation of this facility are available.

2.4 Other Investigations

Formal state inspection reports for both the original and the present facilities are contained in PennDER files for the years 1919, 1950, 1960, and 1965.

2.5 Evaluation.

The available data, coupled with the information obtained during the visual inspection, are considered adequate to make a reasonable Phase I assessment of the facility.

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the facility suggests it to be in good condition.

b. Embankment. Observations made during the visual inspection indicate the embankment is in good condition. No seepage through the downstream face of the dam or indications of embankment instability were noted during the field inspection. Some minor deficiencies were observed which will require the remedial attention. These include:

1. Low area in the right abutment (1.1-foot below the design top of the dam) beyond the apparent end of the embankment.

2. Low area in the left abutment (0.4-foot).

3. The entire upstream embankment face is heavily overgrown with weeds, brush, and trees up to six inches in diameter.

4. The downstream embankment face in the vicinity of the spillway is covered with brush and small trees.

c. Appurtenant Structures.

1. Spillway. The condition of the spillway is considered to be good (see Photographs 8, 9, and 11). A large stump and a section of a boat dock were observed lodged in the spillway forebay. Moderate scaling and a few minor spalls were observed over the ogee crest. The spillway sidewalls exhibit only minor cracking. An apron is constructed downstream of the spillway with an approximate 15 percent grade. The apron shows signs of distress and requires remedial attention to protect it from further deterioration (see Photograph 11). Water action has displaced some of the random rock dumped adjacent to the curtain wall.

2. Outlet Works. The visible parts of the outlet works (intake structure and discharge structure) were found to be in good condition. The concrete intake structure is located approximately 25 feet upstream of the crest of the dam and was inaccessible by foot at the time of inspection (see Photographs 5 and 6). The control valve mechanism was not operated during the inspection; however, the owner stated that the gate was operated about two years ago.

d. Reservoir Area. The general area surrounding the reservoir is comprised of moderate to steep slopes that are heavily forested (see Photographs 1 and 2). No signs of slope distress were observed.

e. Downstream Channel. The spillway discharges into Dingmans Creek, a steeply sloped braided stream set in a narrow valley between steep, heavily wooded side slopes. The potential hazard area is located approximately 500 feet downstream of the dam where Dingmans Creek parallels Legislative Route 51006. Several small business establishments are located along the left bank of the stream. Many residences are located along both banks of Dingmans Creek for the next mile. Due to their close proximity to the streambed, approximately 15 homes and as many as 50 persons could be affected in this area by the floodwaters associated with an embankment breach. Consequently, the hazard classification is considered to be high.

3.2 Evaluation.

The overall condition of the facility is considered to be good. Low areas were noted at or near both embankment-abutment junctions. These levels should be verified by an accurate survey and remedial measures implemented. The operability of the sluice gate should be verified. Efforts should also be made to clear embankment overgrowth from both the upstream and downstream slopes. Some concrete deterioration is evident in the spillway and spillway apron which should be repaired along with the rearrangement of displaced riprap observed in the discharge channel. In addition, potential obstructions to free spillway discharge such as the large stump and boat dock section observed in the spillway forebay should be removed.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

The facility is essentially self-regulating. That is, excess inflow discharges automatically over the spillway and is directed downstream. Normally, the outlet conduit is closed. No formal operations manual is available.

4.2 Maintenance of Dam.

No formal maintenance program exists for the dam. The owner stated that responsibility for maintenance of the facility was transferred to Pocono Mountain Lake Estates in exchange for shoreline property and use of the lake.

4.3 Maintenance of Operating Facilities.

The only operable appurtenance associated with the facility is the manually controlled sluice gate at the inlet of the outlet conduit. Regular maintenance is not performed and no maintenance manual is available.

4.4 Warning System.

There is no formal warning system for the facility.

4.5 Evaluation.

No formal operations or maintenance manuals are available for the facility, but are recommended to ensure proper future care and operation. In addition, a formal warning system should be developed and incorporated into any such manuals.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No formal design reports or calculations are available. A state permit application report for the reconstruction of the dam, dated 1955, indicates that the spillway was designed with a discharge capacity of about 5,370 cfs, based on a spillway opening 110 feet long and 5.5 feet deep (as-built), using 3.78 as the coefficient of discharge. The design capacity exceeded 1955 state requirements and was subsequently approved.

5.2 Experience Data.

Records of reservoir levels and/or spillway discharges are not available.

5.3 Visual Observations.

On the date of inspection, no conditions were observed that would indicate the spillway could not function satisfactorily during a flood event, within the limits of its design capacity.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U. S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U. S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with the procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Beaver Pond Dam ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. This classification is based on the relative size of the dam (small) and the potential hazard of dam failure to downstream developments (high). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF.

b. <u>Results of Analysis</u>. Beaver Pond Dam was evaluated under normal operating conditions. That is, the reservoir was initially at its normal pool or spillway elevation of approximately 1172.0 feet, with the spillway weir discharging freely. The outlet conduit was assumed to be non-functional for the purpose of analysis, since the flow capacity of this conduit is not such that it would significantly increase the total discharge capabilities of the dam and reservoir. The spillway consists of an uncontrolled, rectangular shaped, concrete chute channel with discharges regulated by a concrete ogee-type weir.

Lake Rene Dam and Marcel Lake Dam, located upstream of Beaver Pond Dam, were considered in this analysis to determine their effects on Beaver Pond Dam. They also were evaluated under normal operating conditions. That is, the reservoirs were initially at normal pool; the spillways were assumed to be discharging freely; and, the outlet conduits were assumed to be closed. The outflow from Lake Rene Dam was routed directly into Marcel Lake, and the total outflow from Marcel Lake Dam was routed directly into Beaver Pond. All pertinent engineering calculations relative to the evaluation of Beaver Pond Dam, including those pertaining to the upstream facilities, are included in Appendix D.

Overtopping analysis (using the modified HEC-1 computer program) indcated that the discharge/storage capacity of Beaver Pond Dam can accommodate only about 40 percent of the PMF prior to overtopping of the low area in the embankment crest (elevation 1177.4). It is also noted that under events of 0.3 PMF magnitude or greater, discharge would occur around the right abutment, and under events of 0.37 PMF magnitude or greater, discharge would occur around both the left and right abutments (Appendix D, Sheet 13; Summary Input/ Output Sheets, Sheet K; Appendix A, "Profile of Dam Crest from Field Survey"). The upstream facilities, Lake Rene Dam and Marcel Lake Dam, can accommodate about 70 percent and 38 percent of the PMF, respectively, prior to embankment overtopping. Under 1/2 PMF (SDF) conditions,the Beaver Pond Dam embankment would be inundated for about 3.0 hours, by depths of up to 0.7 feet above the low area in the embankment crest (Summary Input/Output Sheets, Sheets J and K). Since the SDF for Beaver Pond Dam is the 1/2 PMF, it can be concluded that the dam has a high potential for overtopping, and thus, for breaching under floods of 1/2 PMF magnitude or less.

As Beaver Pond Dam cannot safely accommodate a flood of at least 1/2 PMF magnitude, the possibility of embankment failure under floods of 1/2 PMF intensity or less was investigated (in accordance with Corps directive ETL-1110-2-234). Several possible alternatives were examined, since it is difficult, if not impossible, to determine exactly how or if a specific dam will fail. The major concern of the breaching analysis is with the impact of the various breach discharges on increasing downstream water surface elevations above those to be expected if breaching did not occur.

The modified HEC-1 computer program was used for the breaching analysis, with the assumption that the breaching of an earth dam would commence once the low area in the embankment crest was overtopped. (It was assumed that the discharge around the left and right abutments alone, which would occur prior to the overtopping of the main embankment, would not ultimately lead to the failure of the dam.) Also, in routing the outflows downstream, the channel bed was assumed to be initially dry.

Five breach models were analyzed for Beaver Pond Dam. Two sets of breach geometry were evaluated for each of two failure times (Appendix D, Sheet 18). The two sets of breach sections chosen were considered to be the minimum and maximum probable failure sections. The two failure times (total time for each breach section to reach its final dimensions) under which the two breach sections were investigated were assumed to be a rapid time (0.5 hours) and a prolonged time (3.0 hours), so that a range of this most sensitive variable might be examined. In addition, an average possible set of breach conditions was analyzed, with a failure time of 1.0 hours.

The peak breach outflows (resulting from 0.43 PMF conditions) at Beaver Pond Dam ranged from about 5,570 cfs for the minimum section - maximum fail time scheme to about 8,700 cfs for the maximum section - minimum fail time scheme. The peak outflow resulting from the average breach scheme was about 6,170 cfs, compared to the non-breach 0.43 PMF peak outflow of approximately 5,540 cfs (Appendix D, Sheet 20).

The principal center of damage investigated is at Section 1 (see Figure 1), approximately 500 feet downstream from Beaver Pond Dam, where several small businesses and residences are located. Within this reach, the 0.43 PMF non-breach outflows resulted in a peak water surface elevation of about 2.1 feet above the damage level of the structures. However, the water surface elevations resulting from the breach models were as much as 3.0 feet above the damage level of the structures, representing increases of up to 0.9 feet (Appendix D, Sheet 20).

The consequences of dam failure can better be envisioned if not only the increase in the height of the floodwave is considered, but, also the great increase in momentum of the larger and probably swifter moving volume of water. In addition, there is the possibility of a failure section larger than those analyzed, which could result from a total or partial failure of the spillway weir itself, which could result in even higher downstream water surface elevations.

From this analysis, it is concluded that the failure of Beaver Pond Dam is quite possible, and would most likely lead to increased property damage and possibly to loss of life in the downstream region.

5.6 Spillway Adequacy.

As presented previously, Beaver Pond Dam can accommodate only about 40 percent of the PMF prior to embankment overtopping. Should an event of this magnitude or greater occur, the dam would be overtopped and could possibly fail, endangering downstream residents and increasing the potential for loss of life in the downstream regions. Therefore, the spillway is considered to be seriously inadequate.

SECTION 6

EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appeared to be in good condition. A few minor deficiencies were noted at the time of inspection which will require remedial attention. They are:

1. Low areas approximately one-foot below the design crest elevation occur in both the left and right abutments. An accurate survey is recommended and the areas should be regraded consistent with the design top of dam elevation.

2. The roots of trees growing on the dam may increase the seepage potential through the embankment and uprooting of the trees by high winds could cause substantial volume of the embankment material to be displaced. Hence, the trees and their root systems should be removed.

b. Appurtenant Structures.

1. Spillway. The spillway is in good condition with only minor spalling and cracking being observed on the ogee structure and sidewalls. Minor deterioration of the spillway apron was evident which will require patching or grouting. Displaced riprap observed in the discharge channel should be rearranged to provide for maximum erosion protection.

2. Outlet Works. The outlet works appears to be in good condition. No concrete deterioration or corrosion of the valve operator was evident.

6.2 Design and Construction Techniques.

No design or construction records are available with the exception of construction drawings and a few dated photographs contained in PennDER files. A state inspection report, dated July 1956, indicated that construction had been completed in accordance with the plans and specifications.

6.3 Past Performance.

No formal records of past performance are available from the owner; however, information contained in PennDER files suggest that the reconstructed facility has performed satisfactorily since its completion.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and thus, may be subject to minor earthquake induced dynamic forces. As the overall static stability of the embankment appears adequate, it is believed that the facility can withstand minor earthquake induced dynamic forcs. However, no calculations and/or investigations were performed to confirm this opinion.

SECTION 7

ASSESSMENT AND RECOMMENDATION FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The results of this evaluation indicate the facility is in good condition.

The size classification of the facility is small and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood for the facility ranges between the 1/2 PMF (Probable Maximum Flood) to the PMF. This classification is based on the relative size of the facility (small) and the potential hazard of dam failure to downstream developments (high). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Hydraulic and hydrologic analyses indicate the facility will pass and/or store approximately 40 percent of the PMF prior to embankment overtopping at the low area in the embankment crest (elevation 1177.4). Breach analysis indicates that failure under less than 1/2 PMF conditions could lead to increased downstream damage and potential for loss of life. Thus, based on screening criteria provided in the recommended guidelines, the spillway is considered to be seriously inadequate and the facility unsafe, non-emergency.

b. Adequacy of Information. The available information is considered adequate to make an accurate Phase I assessment of the facility.

c. Urgency. The recommendations listed below should be implemented immediately.

d. Necessity for Additional Investigations. Additional investigations are currently deemed necessary to more accurately assess the adequacy of the spillway.

7.2 Recommendations/Remedial Measures.

a. Develop a formal emergency warning system to notify downstream residents should hazardous embankment conditions develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

b. Retain the services of a registered professional engineer experienced in the hydraulics and hydrology of dams to more accurately assess the adequacy of the spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

c. Have the embankment and immediate abutment areas accurately surveyed and infill any low areas to restore the crest to the design elevation of 1177.5 feet.

d. Repair all areas of deterioration in the concrete surfaces of the spillway and spillway apron, and rearrange any displaced riprap in the discharge channel.

e. Remove the potentially obstructing debris lodged in the spillway forebay.

f. Remove all the trees, their root systems, and brush from the crest, upstream and downstream embankment slopes. This operation should be conducted under the guidance of a soils engineer experienced in the design and construction of earth dams.

g. Develop formal manuals of operation and maintenance to ensure the future proper care of the facility.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Beaver Pond Dam STATE Pennsylvania COUNTY Pike

NDI # PA — 00408 PENNDER # 52-13

TYPE OF DAM Earth SIZE Small HAZARD CATEGORY High

DATE(S) INSPECTION 13 November 1980 WEATHER Clear TEMPERATURE 50° @ 12:00 noon

POOL ELEVATION AT TIME OF INSPECTION 1172.1 feet M.S.L.

TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	*OTHERS*
B. M. Mihalcin	None	
D. J. Spaeder		
K. H. Khilji		

RECORDED BY B. M. Mihalcin

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00408
SURFACE CRACKS	None observed. Embankment crest and downstream embankment slope are primarily grass covered. Many small trees (less than 12 inches in diameter) line the embankment crest on both sides, partially obscuring its view.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - Curved alignment. Vertical - see "*Profile of Dam Crest* from Field Survey," Appendix A.
RIPRAP FAILURES	None observed. Riprap is hard, well graded sandstone extending to the top of the dam. Excellent condition.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition at spillway. Cutoff walls evident. No erosion at abutments, but survey indicates abutments are low just beyond embankment contacts.

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00408
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	None observed.
ANY NOTICEABLE SEEPAGE	None observed.
STAFF GAGE AND RECORDER	None.
DRAINS	None observed.
MISCELLANEOUS	Trees and brush have overgrown both slopes and the crest particularly adjacent to the spillway. Trees and root systems should be removed.

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00408
INTAKE STRUCTURE	Intake tower (concrete) located within reservoir at left end of spillway. Not accessible by foot but appears to be in good condition.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	Outlet conduit is 36-inch diameter reinforced concrete pipe. Outlet end is slightly damaged but pipe appears in good condition.
OUTLET STRUCTURE	Concrete pipe extends through an endwall attached to the left spillway sidewall. Concrete is in good condition.
OUTLET CHANNEL	Natural channel, possibly lined with rock. Private bridge about 175 feet downstream of spillway will obstruct high discharges. Bridge will probably fail.
GATE(S) AND OPERATIONAL EQUIPMENT	Rodney Hunt operator located atop intake tower. Inaccessible, but appears to be in good condition.

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00408
TYPE AND CONDITION	Uncontrolled, rectangular shaped, concrete chute channel with an ogee-type weir. Overall condition is good.
APPROACH CHANNEL	Rock lined approach. One large stump and a section of boat dock were lodged in forebay. Should be removed.
SPILLWAY CHANNEL AND SIDEWALLS	Spillway weir is in good condition. Spillway apron shows some cracking (holes in slab) near right sidewall, but generally good condition. Spillway sidewalls exhibit only minor cracking.
STILLING BASIN PLUNGE POOL	None. Flow discharges into boulder strewn channel.
DISCHARGE CHANNEL	Spillway discharges into natural stream. Toe of spillway is protected by concrete endwall. Some riprap appears to be displaced. Should be re-arranged.
BRIDGE AND PIERS EMERGENCY GATES	None.

SERVICE SPILLWAY

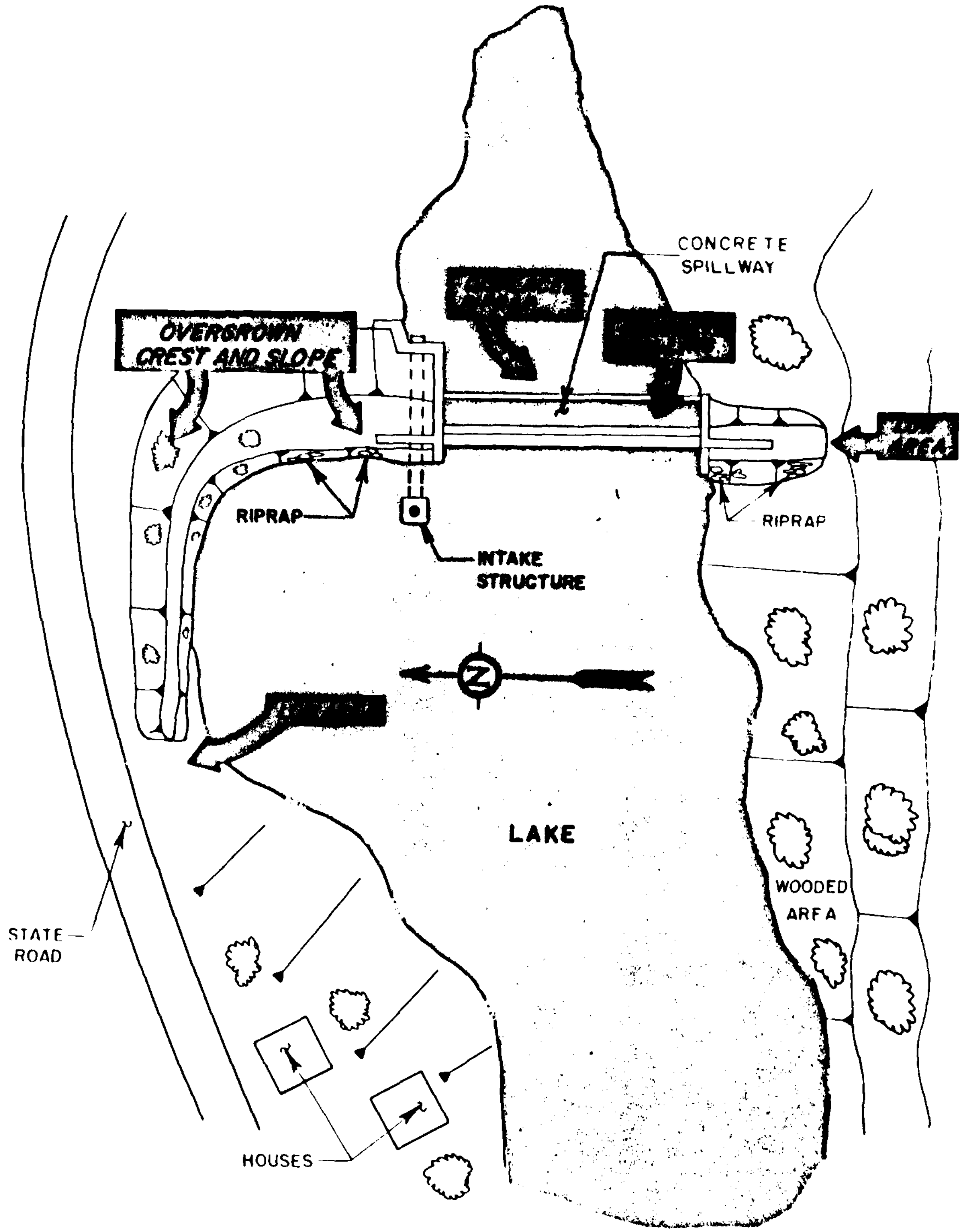
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00408
TYPE AND CONDITION	N/A.
APPROACH CHANNEL	N/A.
OUTLET STRUCTURE	N/A.
DISCHARGE CHANNEL	N/A.

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00408
MONUMENTATION SURVEYS	None observed.
OBSERVATION WELLS	None observed.
WEIRS	None observed.
PIEZOMETERS	None observed.
OTHERS	

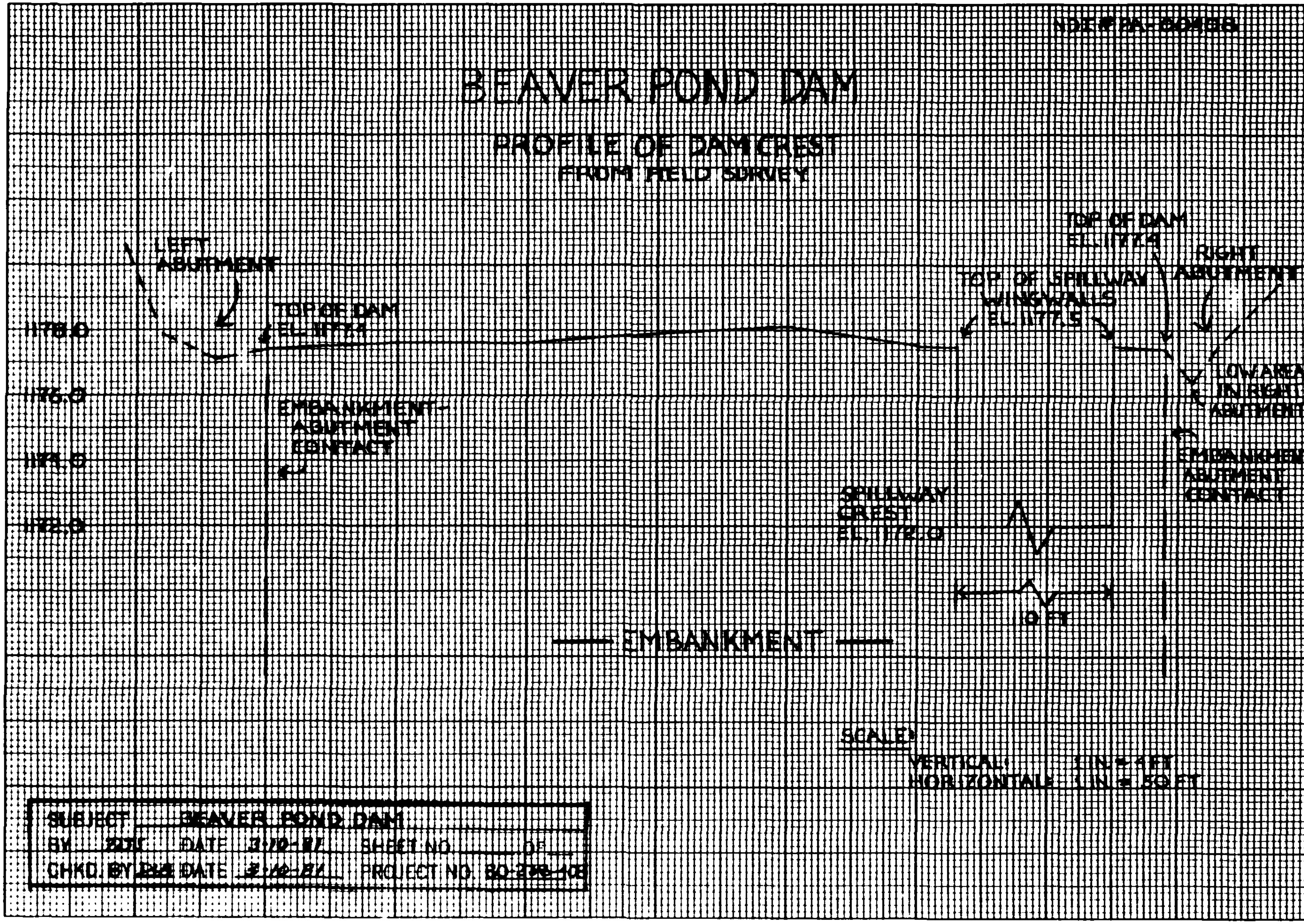
RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00408
SLOPES: RESERVOIR	Moderate to steep reservoir slopes. Heavily wooded.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Private bridge about 175 feet downstream of spillway will obstruct large discharges but will probably fail.
SLOPES: CHANNEL VALLEY	Steep, narrow and heavily wooded.
APPROXIMATE NUMBER OF HOMES AND POPULATION	Many homes (≈ 15) located along downstream channel between Beaver Pond Dam and Nyce Lake. Two commercial buildings are also located within 500 feet of the dam. It is estimated that as many as 50 persons could be affected by the floodwaters resulting from an embankment breach.



BEAVER POND DAM
GENERAL PLAN-FIELD INSPECTION NOTES

46 1242


BEAVER POND DAM
PROFILE OF DAM CREST
FROM FIELD SURVEY
LEFT ABUTMENT
TOP OF DAM EL. 1177.4
EMBANKMENT-ABUTMENT CONTACT
1178.0
1176.0
1174.0
1172.0
TOP OF DAM EL. 1177.4
TOP OF SPILLWAY WINGWALLS EL. 1177.5
RIGHT ABUTMENT
LOW AREA IN RIGHT ABUTMENT
EMBANKMENT-ABUTMENT CONTACT
SPILLWAY CREST EL. 1172.0
10 FT
EMBANKMENT
SCALE:
VERTICAL: 1 IN = 4 FT
HORIZONTAL: 1 IN = 50 FT
SUBJECT BEAVER POND DAM
BY DATE 3-10-81 SHEET NO. OF
CHKD. BY DATE 3-10-81 PROJECT NO.

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
PHASE I

NAME OF DAM Beaver Pond Dam

ITEM	REMARKS — NDI# PA- 00408
PERSONS INTERVIEWED AND TITLE	Via phone: John Eckman, President Eckman Lumber Co. (Owner) R. D. #3 Lehighton, PA 18235
REGIONAL VICINITY MAP	See Figure 1, Appendix E.
CONSTRUCTION HISTORY	Constructed in 1956-57 for Camp Massad on Eckman Lumber Co. property. Designed by Edward G. Hess Associates, Inc., of Stroudsburg, Pennsylvania. Constructed by Litz Construction of East Stroudsburg.
AVAILABLE DRAWINGS	Two drawings available from PennDER files; see Figures 2 and 3 of report. Owner also has set of these drawings.
TYPICAL DAM SECTIONS	See Figure 3, Appendix E.
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	See Figures 2 and 3, Appendix E.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

NDI# PA - 00408

ITEM	REMARKS
SPILLWAY: PLAN SECTION DETAILS	See Figures 2 and 3, Appendix E.
OPERATING EQUIP-MENT PLANS AND DETAILS	See Figure 3, Appendix E.
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None.
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	None.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA - 00408
BORROW SOURCES	Not known.
POST CONSTRUCTION DAM SURVEYS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None other than PennDER inspections.
HIGH POOL RECORDS	Not known.
MONITORING SYSTEMS	None.
MODIFICATIONS	None indicated.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS NDI# PA- 00408
PRIOR ACCIDENTS OR FAILURES	None since re-construction in 1956-57.
MAINTENANCE: RECORDS MANUAL	None. See "miscellaneous" below.
OPERATION: RECORDS MANUAL	None.
OPERATIONAL PROCEDURES	Self-regulating. Facility has been drawn down on occasion. Latest drawdown about two years ago to repair docks.
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None.
MISCELLANEOUS	Owner (Eckman Lumber Co.) has agreement (in deed) with Pocono Mountain Lake Estates. Development agreed to maintain dam for use of lake and sale of part of shoreline.

GAI CONSULTANTS, INC.

NDI ID # PA-00408
PENNDER ID # 52-13

CHECK LIST
HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

SIZE OF DRAINAGE AREA: 7.0 square miles.

ELEVATION TOP NORMAL POOL: 1172.0 STORAGE CAPACITY: 61 acre-feet.

ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -

ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -

ELEVATION TOP DAM: 1177.4 STORAGE CAPACITY: 150 acre-feet.

SPILLWAY DATA

CREST ELEVATION: 1172.0 feet.

TYPE: Uncontrolled, rectangular shaped, concrete chute channel with ogee-type weir.

CREST LENGTH: 110 feet

CHANNEL LENGTH: N/A

SPILLOVER LOCATION: Right abutment.

NUMBER AND TYPE OF GATES: None.

OUTLET WORKS

TYPE: Rodney Hunt 36-inch diameter sluice gate.

LOCATION: Upstream toe at left sidewall of spillway.

ENTRANCE INVERTS: 1165.0 feet (design).

EXIT INVERTS: 1163.1 feet (field).

EMERGENCY DRAWDOWN FACILITIES: 36-inch diameter sluice gate.

HYDROMETEOROLOGICAL GAGES

TYPE: None.

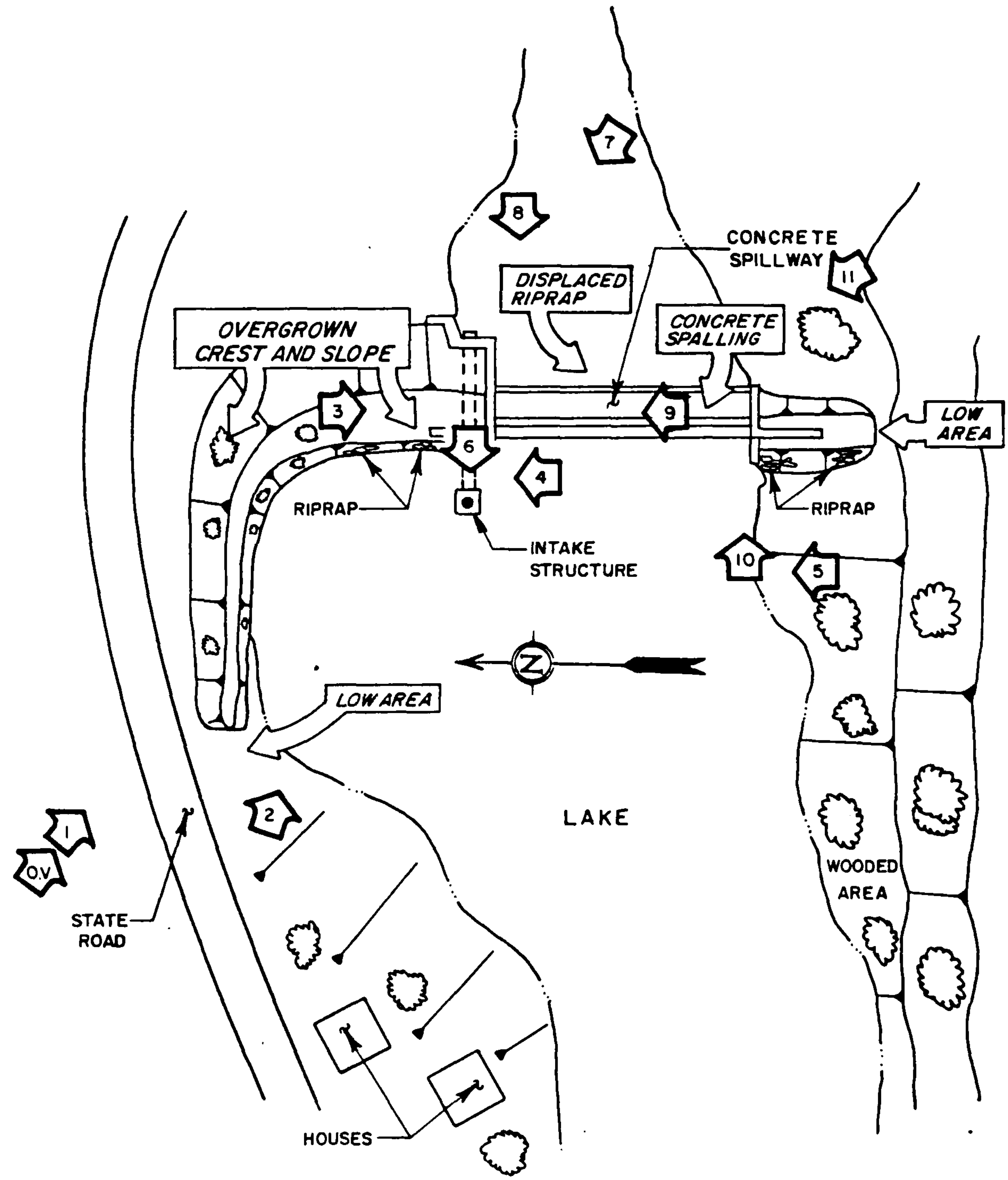
LOCATION: -

RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: Unknown.

APPENDIX C

PHOTOGRAPHS



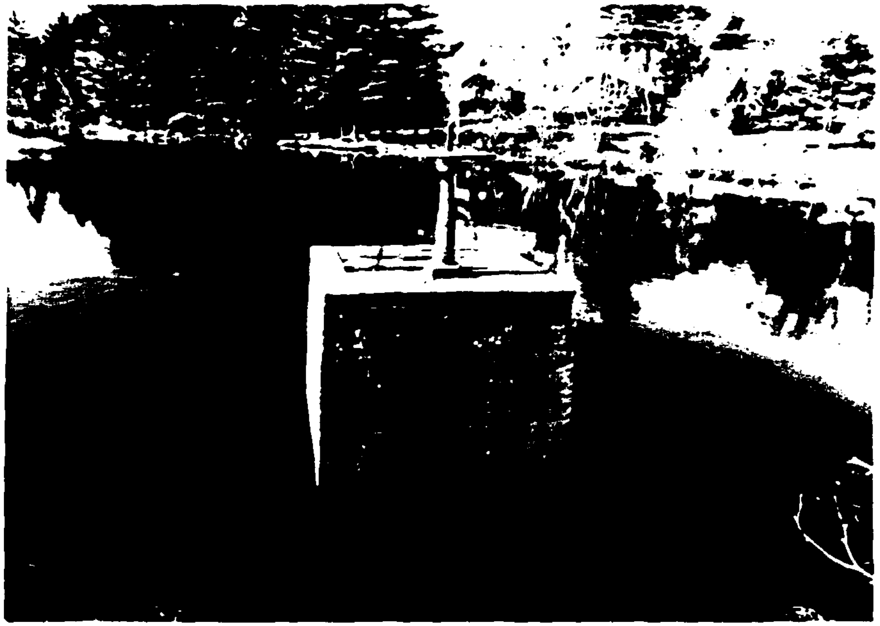
BEAVER POND DAM
PHOTOGRAPH KEY MAP

1

2

4

5



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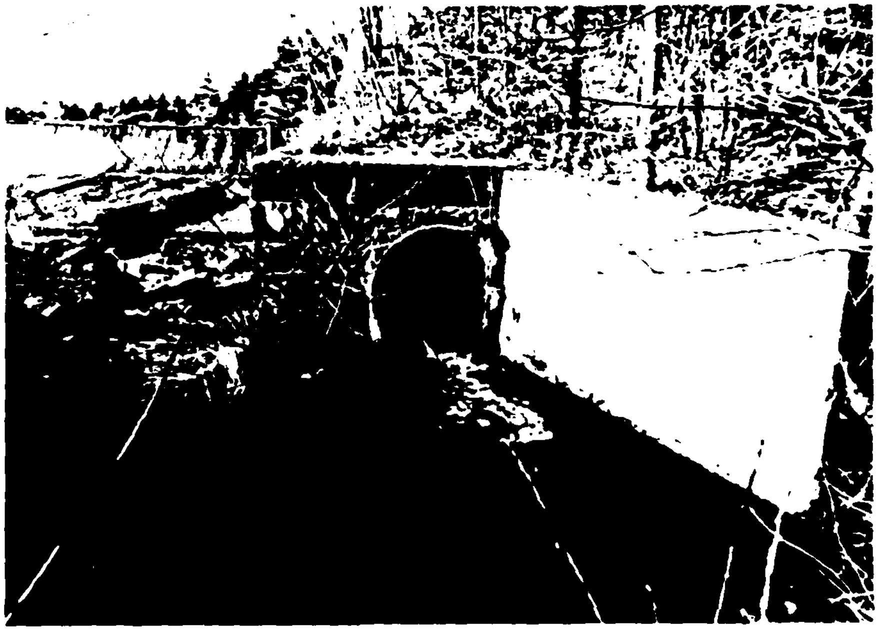

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9

10

APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSES

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of occurrence the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevation(s) of failure hydrograph(s) for each location.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: BEAVER POND DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0 INCHES/24 HOURS (1)

STATION	1	2	3
STATION DESCRIPTION	LAKE RENE DAM	MARCEL LAKE DAM	BEAVER POND DAM
DRAINAGE AREA (SQUARE MILES)	1.6	2.7	2.7
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	1.6	4.3	7.0
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)	Zone 1	Zone 1	Zone 1
6 HOURS	111	111	111
12 HOURS	123	123	123
24 HOURS	133	133	133
48 HOURS	142	142	142
72 HOURS	-	-	-
SNYDER HYDROGRAPH PARAMETERS			
ZONE (2)	1	1	1
C_p (3)	0.45	0.45	0.45
C_t (3)	1.23	1.23	1.23
L (MILES) (4)	2.5	2.7	3.3
L_{ca} (MILES) (4)	1.2	1.2	1.4
$t_p = C_t\ (L \cdot L_{ca})^{0.3}$ (HOURS)	1.71	1.75	1.95
SPILLWAY DATA (5)			
CREST LENGTH (FEET)	55	60	110
FREEBOARD (FEET)	5.0	5.5	5.4

(1) HYDROMETEOROLOGICAL REPORT 33, U.S. ARMY CORPS OF ENGINEERS, 1956.

(2) HYDROLOGIC ZONE DEFINED BY CORPS OF ENGINEERS, BALTIMORE DISTRICT, FOR DETERMINATION OF SNYDER COEFFICIENTS (C_p AND C_t).

(3) SNYDER COEFFICIENTS

(4) L = LENGTH OF LONGEST WATERCOURSE FROM DAM TO BASIN DIVIDE
L_{ca} = LENGTH OF LONGEST WATERCOURSE FROM DAM TO POINT OPPOSITE BASIN CENTROID.

(5) SPILLWAY DATA RELATING TO LAKE RENE DAM AND MARCEL LAKE DAM OBTAINED FROM PHASE I INSPECTION REPORT, MARCEL LAKE DAM (SEE NOTE 3, SHEET 14 OF 20).

SUBJECT	DAM SAFETY INSPECTION		
	BEAVER POND DAM		
BY RJS	DATE 1-29-81	PROJ. NO. 80-238-408	
CHKD. BY DLB	DATE 3 4 81	SHEET NO. 1 OF 20	

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DAM STATISTICS

HEIGHT OF DAM = 14 FT (FIELD MEASURED: TOP OF DAM TO D.S. OUTLET INVERT; "TOP OF DAM" HERE AND ON ALL SUBSEQUENT CALCULATION SHEETS REFERS TO THE LOW AREA IN THE EMBANKMENT CREST.)

NORMAL POOL STORAGE CAPACITY = 20×10^6 GALLONS
≃ 61.4 AC-FT (SEE NOTE 1)

MAXIMUM POOL STORAGE CAPACITY = 149.8 AC-FT (SHEET 4)
(@ TOP OF DAM)

DRAINAGE AREA:

LAKE RENE SUB-BASIN:	1.6
MARCEL LAKE LOCAL SUB-BASIN:	2.7
BEAVER DAM LOCAL SUB-BASIN:	2.7
TOTAL:	7.0 SQUARE MILES

(PLANIMETERED ON USGS 7.5' TOPO QUADS — EDGEMERE, AND LAKE MASKENOZHA, PA)

ELEVATIONS:

TOP OF DAM (DESIGN)	≃ 1177.5	(FIG 3 ; SEE NOTE 2)
TOP OF DAM (FIELD)	≃ 1177.4	
NORMAL POOL	≃ 1172.0	(SEE NOTE 2)
SPILLWAY CREST	≃ 1172.0	(FIG 3 ; SEE NOTE 2)
UPSTREAM INLET INVERT (DESIGN)	≃ 1165.0	(FIG 3 ; SEE NOTE 2)
DOWNSTREAM OUTLET INVERT (DESIGN)	≃ 1164.6	(FIG 3 ; SEE NOTE 2)
DOWNSTREAM OUTLET INVERT (FIELD)	≃ 1163.1	
STREAMBED @ DAM CENTERLINE	≃ 1164.6	(ESTIMATED FROM FIG. 3 ; SEE NOTE 2)

SUBJECT DAM SAFETY INSPECTION

BEAVER POND DAM

BY DJJ DATE 1-29-81 PROJ. NO 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 2 OF 22

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NOTE 1: OBTAINED FROM "REPORT UPON THE APPLICATION OF MASSAD CAMPS, INC., FOR THE RECONSTRUCTION OF A DAM ACROSS DINGMANS CREEK, IN DELAWARE TOWNSHIP, PIKE COUNTY;" NOVEMBER, 1955; FOUND IN PENN DER FILES.

NOTE 2: THE DESIGN DRAWINGS ARE BASED ON A NORMAL POOL OR SPILLWAY ELEVATION OF 99.4 FEET. THE USGS TOPO QUAD FOR EDGEMERE, PA, INDICATES THE NORMAL POOL ELEVATION IS SOMEWHERE BETWEEN 1160.0 AND 1180.0. IT WILL BE ASSUMED THAT THE SPILLWAY CREST IS AT ELEVATION 1172.0, AND THUS 1072.6 FEET (OR 1172.0 - 99.4) WILL BE ADDED TO ALL THE ELEVATIONS INDICATED ON THE DESIGN DRAWINGS. (THE VALUE 1172 WAS ASSUMED, IN ORDER TO BEST MATCH THE RESULTS OF THE FIELD SURVEY WITH THE CONTOURS ON THE USGS TOPO MAP. IT IS NOTED THAT THE ELEVATIONS USED IN THIS ANALYSIS ARE CONSIDERED ESTIMATES, AND ARE NOT NECESSARILY ACCURATE.)

DAM CLASSIFICATION ✓

DAM SIZE: SMALL (REF. 1, TABLE 1)

HAZARD CLASSIFICATION: HIGH (FIELD OBSERVATION)

REQUIRED SDF: ½ PMF TO PMF (REF 1, TABLE 3)

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 1-29-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 3 OF 20

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HYDROGRAPH PARAMETERS

FOR LOCAL SUB-BASIN:

LENGTH OF LONGEST WATERCOURSE: L = 3.3 MILES

LENGTH OF LONGEST WATERCOURSE FROM DAM TO A POINT OPPOSITE BASIN CENTROID: L_{CA} = 1.4 MILES

(MEASURED ON USGS TOPO QUAD: EDGEMERE, AND LAKE MASKENOZHA, PA)

C_t = 1.23
C_p = 0.45

(SUPPLIED BY C.O.E., ZONE 1, DELAWARE RIVER BASIN)

SNYDER'S STANDARD LAG:

$$t_p = C_t (L \cdot L_{CA})^{0.3}$$
$$= 1.23(3.3 \times 1.4)^{0.3}$$
$$= 1.95 \text{ HOURS}$$

(NOTE: HYDROGRAPH VARIABLES USED HERE ARE DEFINED IN REF. 2, IN SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH.")

RESERVOIR CAPACITY

RESERVOIR SURFACE AREAS:

SURFACE AREA (SA) @ NORMAL POOL (EL 1172.0) = 13 ACRES
SA @ EL 1180 = 23 ACRES
SA @ EL 1200 = 72 ACRES

(USGS TOPO QUADS: EDGEMERE + LAKE MASKENOZHA)

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S.A. @ TOP OF DAM (EL. 1177.4) = 19.8 ACRES
(BY LINEAR INTERPOLATION)

IT IS ASSUMED THAT THE MODIFIED PRISMOIDAL RELATIONSHIP ADEQUATELY MODELS THE RESERVOIR SURFACE AREA - STORAGE RELATIONSHIP:

(REF 14, p. 15)

$$\Delta V_{1-2} = \frac{h}{3}\left(A_1 + A_2 + \sqrt{A_1 \cdot A_2}\right)$$

WHERE ΔV_{1-2} = INCREMENTAL HEAD BETWEEN ELEVATIONS 1 + 2, IN AC-FT,
h = ELEVATION 1 - ELEVATION 2, IN FT,
A_1 = S.A. @ ELEVATION 1, IN ACRES,
A_2 = S.A. @ ELEVATION 2, IN ACRES.

IT IS ALSO ASSUMED THAT THE SURFACE AREA VARIES LINEARLY BETWEEN THE ELEVATIONS INDICATED ABOVE.

ELEVATION - STORAGE RELATIONSHIP:

ELEVATION (FT)	A_i (AC)	ΔV_{1-2} (AC-FT)	TOTAL VOLUME (AC-FT)
1165.0	0	—	0 *
(NORMAL POOL) 1172.0	13	—	61.4 *
1174.0	15.5	28.5	89.9
1176.0	18.0	33.5	123.4
(TOP OF DAM) 1177.4	19.8	26.4	149.8
1178.0	20.5	12.1	161.9
1180.0	23	43.5	205.4
1182.0	27.9	50.8	256.2
1185.0	35.3	94.6	350.8

* ZERO-STORAGE ELEVATION AND NORMAL POOL STORAGE CAPACITY FROM SHEET 1.

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 1-29-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 5 OF 30

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PMP CALCULATIONS

APPROXIMATE RAINFALL INDEX = 22.0 INCHES
(CORRESPONDING TO A DURATION OF 24 HOURS AND A DRAINAGE AREA OF 200 SQUARE MILES)

(REF. 3, FIG. 1)

DEPTH-AREA-DURATION ZONE 1 (REF. 3, FIG. 1)

ASSUME DATA CORRESPONDING TO A 10-SQUARE MILE AREA MAY BE APPLIED TO THIS 2.7 SQUARE MILE BASIN:

DURATION (HRS)	PERCENT OF INDEX RAINFALL
6	111
12	123
24	133
48	142

(REF. 3, FIG. 2)

HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AND FOR THE LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALL BASIN) FOR A DRAINAGE AREA OF 2.7 SQUARE MILES IS 0.80.

(REF 4, p 48)

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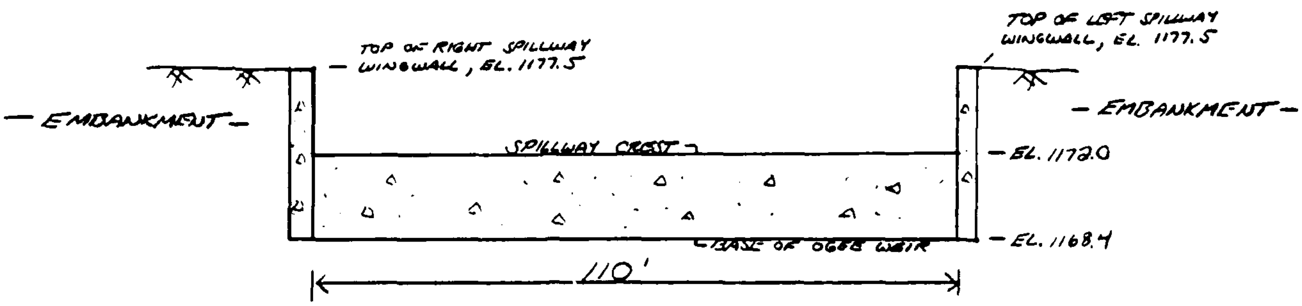
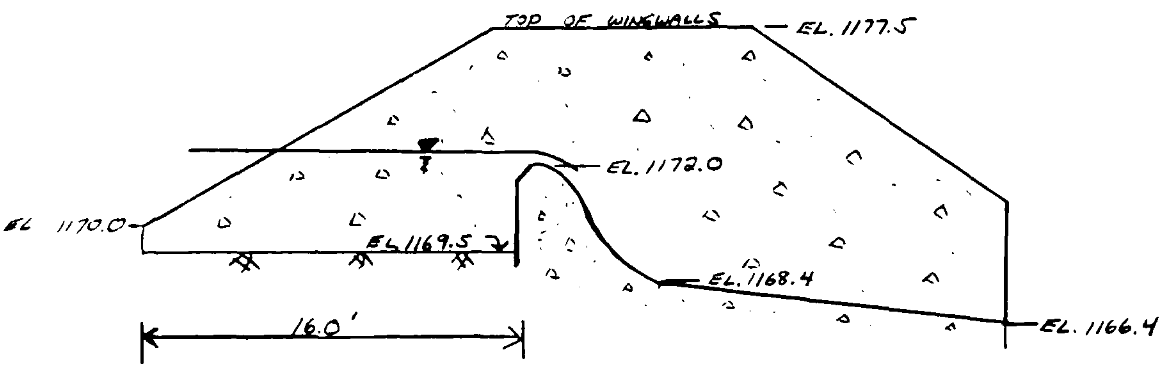
SPILLWAY CAPACITY

CROSS-SECTION: - LOOKING UPSTREAM -



- NOT TO SCALE -

PROFILE:



- NOT TO SCALE -

SKETCHES BASED ON FIELD NOTES AND ON FIG. 3.

THE SPILLWAY CONSISTS OF A RECTANGULAR-SHAPED CONCRETE CHUTE CHANNEL WITH A CONCRETE OGEE-TYPE WEIR, AS SKETCHED ABOVE.

SUBJECT DAM SAFETY INSPECTION

BEAVER POND DAM

BY DJS DATE 1-29-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 7 OF 20

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DISCHARGE CAN BE ESTIMATED BY THE EQUATION

$$Q = CLH^{3/2} \qquad \text{(REF 4, p. 373)}$$

WHERE Q = DISCHARGE, IN CFS,
C = COEFFICIENT OF DISCHARGE,
L = LENGTH OF WEIR CREST = 110 FT,
H = HEAD, IN FT.

THE DESIGN HEAD, H_o, IS ASSUMED TO BE 5.5 FEET, OR TO THE TOP OF THE SPILLWAY WINGWALLS. IT IS ASSUMED THAT THE RELATIONSHIPS IN REF 4, pp. 372-382, CAN BE APPLIED TO THIS OGEE-TYPE WEIR. FOR A FOREBAY DEPTH OF 2.5 FEET,

$$\frac{P}{H_o} = \frac{2.5}{5.5} = 0.45$$

$$\therefore C_o = \underline{3.78} \qquad \text{(REF 4, p. 378, FIG. 249)}$$

APPROACH CHANNEL LOSSES @ DESIGN HEAD DISCHARGE:

APPROACH CHANNEL LENGTH = 16.0 FT

APPROACH CHANNEL WIDTH = 110 FT

AT EL. 1177.5 (DESIGN POOL),

AVERAGE APPROACH CHANNEL DEPTH = 2.5 + 5.5 = 8.0 FT

FLOW AREA = 8.0 x 110 = 880 FT^2

- INITIAL ESTIMATE OF DISCHARGE:

$$Q = CLH^{3/2} = (3.78)(110)(5.5)^{3/2} = \underline{5363} \text{ CFS}$$

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- AVERAGE VELOCITY IN APPROACH CHANNEL:

$$V_A = \frac{Q}{A} = \frac{5363}{880} = \underline{6.1} \text{ FPS}$$

- AVERAGE APPROACH VELOCITY HEAD:

$$h_A = \frac{V_A^2}{2g} = \frac{(6.1)^2}{64.4} = \underline{0.58} \text{ FT}$$

- ASSUMING THAT THE APPROACH CHANNEL ENTRANCE LOSS = $0.1\,h_A$ (REF 4, p. 379)

$$h_E = \text{ENTRANCE LOSS} = (0.1)(0.58) = \underline{0.06} \text{ FT}$$

- APPROACH CHANNEL FRICTION LOSS, h_F:

$$h_F = \left[\frac{V_A\, n}{1.486\, R^{2/3}}\right]^2 \times L_c$$ (REF 4, p. 379)

WHERE L_c = LENGTH OF APPROACH CHANNEL = 16.0 FT,
n = MANNINGS ROUGHNESS COEFFICIENT = 0.035,
(COMPOSITE; FIELD OBSERVATION)
R = HYDRAULIC RADIUS = FLOW AREA / WETTED PERIMETER.

WETTED PERIMETER:

$$\text{AVG. HT. OF WINGWALL} = \frac{(1.0)(8.0) + (15.0)\left(\frac{8.0+0.5}{2}\right)}{16.0} = \underline{4.5} \text{ FT}$$

$\therefore$ AVG WETTED PERIMETER = $2(4.5) + 110 = \underline{119.0}$ FT

$$\text{AVG. HYDRAULIC RADIUS} = R_H = \frac{A}{P} = \frac{880}{119} = \underline{7.4} \text{ FT}$$

$$\therefore h_F = \left[\frac{(6.1)(0.035)}{(1.486)(7.4)^{2/3}}\right]^2 \times 16.0 = \underline{0.02} \text{ FT}$$

$\therefore$ TOTAL APPROACH LOSS = $0.02 + 0.06 = \underline{0.08}$ FT

ACTUAL EFFECTIVE HEAD: $H_E = 5.5 - 0.08 = \underline{5.42}$ FT

$$\text{SPILLWAY CAPACITY @ DESIGN HEAD} = (3.78)(110)(5.42)^{3/2}$$
$$= \underline{5247} \text{ CFS}$$

- FOR HEADS OTHER THAN DESIGN HEAD, THE APPROACH CHANNEL LOSSES WILL BE ASSUMED TO BE PROPORTIONAL TO THE LOSSES AT DESIGN HEAD:

$$h_L = \left(\frac{0.08}{5.5}\right) H$$

WHERE h_L = TOTAL APPROACH CHAN . LOSS, IN FT,
H = RESERVOIR ELEVATION - 1178.0 FT.

EFFECTS OF HEAD OTHER THAN DESIGN HEAD:

AS THE HEAD ON THE WEIR BECOMES SMALL, DISCHARGE IS REDUCED DISPROPORTIONATELY, DUE TO THE ROUGHNESS AND THE CONTACT PRESSURE BETWEEN THE WATER AND THE WEIR SURFACE. THUS, THE DISCHARGE COEFFICIENT (C) TAKES ON A LOWER VALUE THAN THAT OF DESIGN HEAD. THE OPPOSITE TREND OCCURS FOR HEADS GREATER THAN THAT OF DESIGN. THEREFORE, THE DESIGN DISCHARGE COEFFICIENT WILL BE MODIFIED APPROPRIATELY, ACCORDING TO FIG. 250, REF. 4.

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 1-30-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 10 OF 20

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SPILLWAY RATING CURVE:

	RESERVOIR ELEVATION (FT)	H (FT)	H/H₀ ①	C/C₀ ②	C ③	ESTIMATED APPROACH LOSS, h_L (FT) ④	EFFECTIVE HEAD, H_E (FT) ⑤	Q (CFS) ⑥
	1172.0	0	0	—	—	—	—	0
	1173.0	1.0	0.18	0.85	3.21	0.01	0.99	350
	1174.0	2.0	0.36	0.89	3.36	0.03	1.97	1020
	1175.0	3.0	0.55	0.93	3.52	0.04	2.96	1970
	1176.0	4.0	0.73	0.96	3.63	0.06	3.94	3120
	1177.0	5.0	0.91	0.99	3.74	0.07	4.93	4500
(TOP OF DAM)	1177.4	5.4	0.98	1.00	3.78	0.08	5.32	5100
	1177.5	5.5	1.00	1.00	3.78	0.08	5.42	5250
	1178.0	6.0	1.09	1.01	3.82	0.09	5.91	6040
	1179.0	7.0	1.27	1.03	3.89	0.10	6.90	7760
	1180.0	8.0	1.45	1.05	3.97	0.12	7.88	9660
	1181.0	9.0	1.64	1.07	4.04	0.13	8.87	11,740
	1182.0	10.0	1.82	1.07	4.04	0.15	9.85	13,740
	1183.0	11.0	2.00	1.07	4.04	0.16	10.84	15,860
	1184.0	12.0	2.18	1.07	4.04	0.17	11.83	18,080
	1185.0	13.0	2.36	1.07	4.04	0.19	12.81	20,380

① H_0 = DESIGN HEAD = 5.5 FT

② C/C_0 FROM REF 4, FIG. 250, p. 378.

③ $C_0 = 3.78$; $C = 3.78 \times C/C_0$

④ $h_L = \left(\frac{0.08}{5.5}\right) H$ (SEE SHEET 9)

⑤ $H_E = H - h_L$

⑥ $Q = C L H_E^{3/2}$; $L = 110$ FT; (COMPUTED TO NEAREST 10 CFS).

SUBJECT	DAM SAFETY INSPECTION BEAVER POND DAM		
BY	DJJ	DATE	2-2-81	PROJ. NO.	80-238-408
CHKD. BY	DLB	DATE	3-4-81	SHEET NO.	11 OF 20

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EMBANKMENT RATING CURVE

ASSUME THAT THE EMBANKMENT BEHAVES ESSENTIALLY AS A BROAD-CRESTED WEIR WHEN OVERTOPPING OCCURS. THUS, THE DISCHARGE CAN BE ESTIMATED BY THE RELATIONSHIP

$$Q = CLH^{3/2}$$ (REF 5, p. 5-23)

WHERE Q = DISCHARGE OVER EMBANKMENT, IN CFS,
L = LENGTH OF EMBANKMENT OVERTOPPED, IN FT,
H = HEAD, IN FT; IN THIS CASE IT IS THE AVERAGE "FLOW AREA WEIGHTED" HEAD ABOVE THE DAM,
C = COEFFICIENT OF DISCHARGE, DEPENDENT UPON THE HEAD AND THE WEIR BREADTH.

LENGTH OF EMBANKMENT INUNDATED VS. RESERVOIR ELEVATION:

	ELEVATION (FT)	LENGTH (FT)
(LOW AREA IN NATURAL GROUND NEAR RIGHT ABUTMENT)	1176.4	0
(TOP OF DAM)	1177.4	50
	1177.5	100
	1177.7	230
	1177.9	280
	1178.0	320
	1178.5	360
	1179.0	370
	1180.0	390
	1181.0	410
	1182.0	430

(FROM FIELD SURVEY AND USGS TOPO QUAD – EDGEMERE, PA)

SUBJECT DAM SAFETY INSPECTION

BEAVER POND DAM

BY DJS DATE 2-2-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 12 OF 20

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ASSUME THAT INCREMENTAL DISCHARGES OVER THE EMBANKMENT FOR SUCCESSIVE RESERVOIR ELEVATIONS ARE APPROXIMATELY TRAPEZOIDAL IN CROSS-SECTIONAL FLOW AREA. THEN ANY INCREMENTAL AREA OF FLOW CAN BE ESTIMATED AS $H_i\,[(L_1+L_2)/2]$, WHERE L_1 = LENGTH OF OVERTOPPED EMBANKMENT AT HIGHER ELEVATION, L_2 = LENGTH AT LOWER ELEVATION, H_i = DIFFERENCE IN ELEVATIONS. THUS, THE TOTAL AVERAGE "FLOW AREA WEIGHTED" HEAD CAN BE ESTIMATED AS H_w = (TOTAL FLOW AREA/L_1).

EMBANKMENT RATING TABLE:

	RESERVOIR ELEVATION (FT)	L_1 (FT)	L_2 (FT)	INCREMENTAL HEAD, H_i (FT)	INCREMENTAL FLOW AREA, A_i (FT²) ①	TOTAL FLOW AREA, A_T (FT²)	WEIGHTED HEAD, H_w (FT) ②	H_w/l ③	C ④	Q (CFS) ⑤
(LOW SPOT NEAR RT. ABUTMENT)	1176.4	0	—	0	—	—	—	—	—	—
(TOP OF DAM)	1177.4	50	0	1.0	25	25	0.50	0.05	3.02	50
	1177.5	100	50	0.1	8	33	0.33	0.03	3.00	60
	1177.7	230	100	0.2	33	66	0.29	0.03	2.99	110
	1177.9	280	230	0.2	51	117	0.42	0.04	3.01	230
	1178.0	320	280	0.1	30	147	0.46	0.05	3.02	300
	1178.5	360	320	0.5	170	317	0.88	0.09	3.03	900
	1179.0	370	360	0.5	183	500	1.4	0.14	3.04	1860
	1180.0	390	370	1.0	380	880	2.3	0.23	3.08	4190
	1181.0	410	390	1.0	400	1280	3.1	0.31	3.09	6910
	1182.0	430	410	1.0	420	1700	4.0	0.40	3.09	10,630

① $A_i = H_i\,[(L_1+L_2)/2]$

② $H_w = A_T/L_1$

③ l = BREADTH OF CREST = 10 FT (ASSUMED AVG. VALUE; FIELD MEASURED).

④ C = f(H, l); FROM REF 12, FIG 24.

⑤ $Q = C L_1 H_w^{3/2}$ (TO NEAREST 10 CFS)

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJJ DATE 2-2-81 PROJ. NO. 80-238-408
CHKD. BY DLB DATE 3-4-81 SHEET NO. 13 OF 20

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TOTAL FACILITY RATING TABLE

$Q_{TOTAL} \simeq Q_{SPILLWAY} + Q_{EMBANKMENT}$

	RESERVOIR ELEVATION (FT)	① $Q_{SPILLWAY}$ (CFS)	② $Q_{EMBANKMENT}$ (CFS)	Q_{TOTAL} (CFS)
	1172.0	0	–	0
	1173.0	350	–	350
	1174.0	1020	–	1020
	1175.0	1970	–	1970
	1176.0	3120	–	3120
	1176.4	3670*	0	3670
	1177.0	4500	30*,**	4530**
(TOP OF DAM)	1177.4	5100	50	5150
	1177.5	5250	60	5310
	1177.7	5570*	110	5680
	1177.9	5880*	230	6110
	1178.0	6040	300	6340
	1178.5	6900*	900	7800
	1179.0	7760	1860	9620
	1180.0	9660	4190	13,850
	1181.0	11,740	6910	18,650
	1182.0	13,740	10,630	24,370

① FROM SHEET 10.
② FROM SHEET 12.

* - BY LINEAR INTERPOLATION
** - DISCHARGE AROUND THE ABUTMENTS INCLUDED FOR ELEVATIONS ABOVE 1176.4.

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 2-3-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 14 OF 20

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UPSTREAM DAMS:

1.) LAKE RENE DAM

– SNYDER UNIT HYDROGRAPH PARAMETERS:

$L = 2.5$ MILES
$L_{CA} = 1.2$ MILES
$C_p = 0.45$
$C_t = 1.23$
$t_p = 1.23(2.5 \times 1.2)^{0.3} = \underline{1.71}$ HOURS

(SEE SHEET 3)

– PMP DATA – SEE SHEET 5.

– STORAGE - OUTFLOW RELATIONSHIP: (SEE NOTE 3)

ELEVATION (FT)	STAGE ABOVE NORMAL POOL (FT)	SURCHARGE STORAGE (AC-FT)	OUTFLOW (CFS)
1260.0 (ASSUMED NORMAL POOL)	0	0	0
1261.0	1	79	182
1262.0	2	158	513
1263.0	3	237	943
1264.0	4	316	1452
1265.0 (TOP OF DAM)	5	395	2029
1266.0	6	474	5457
1267.0	7	553	11,253

NOTE 3: OBTAINED FROM "PHASE I INSPECTION REPORT," NATIONAL DAM INSPECTION PROGRAM, MARCEL LAKE DAM, NDI-PA 00402, PA-DER 52-149, PREPARED BY O'BRIEN AND GERE; MARCH, 1979.

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2.) MARCEL LAKE DAM

- SNYDER UNIT HYDROGRAPH PARAMETERS:

  $L = 2.7$ MILES
  $L_{CA} = 1.2$ MILES
  $C_p = 0.45$
  $C_T = 1.23$
  $T_p = 1.23(2.7 \times 1.2)^{0.3} = \underline{1.75}$ HOURS

  (SEE SHEET 3)

- PMP DATA – SEE SHEET 5.

- ELEVATION – STORAGE RELATIONSHIP:
  - COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, VIA CONIC METHOD, BASED ON THE FOLLOWING SURFACE AREA DATA (SEE NOTE 3):

	ELEVATION (FT)	SURFACE AREA (ACRES)
	1215	0
(NORMAL POOL)	1231	27
	1240	37
	1260	78

- NORMAL POOL ELEVATION = 1231.0
- TOP OF DAM ELEVATION = 1236.5 (SEE NOTE 3)

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DSS DATE 2-3-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 16 OF 20

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MARCEL LAKE DAM:

FACILITY RATING CURVE: (SEE NOTE 3)

	ELEVATION (FT)	OUTFLOW (CFS)
(NORMAL POOL)	1231.0	0
	1232.0	222
	1233.0	628
	1234.0	1154
	1235.0	1776
	1236.0	2482
(TOP OF DAM)	1236.5	2863
	1237.5	4609
	1238.5	8120
	1239.5	12,964

(NOTE: IT IS ASSUMED IN THIS ANALYSIS THAT SILVER LAKE, A NATURAL LAKE WITHIN THE MARCEL LAKE WATERSHED, HAS NO IMPACT ON REDUCING THE PEAK INFLOW INTO MARCEL LAKE.)

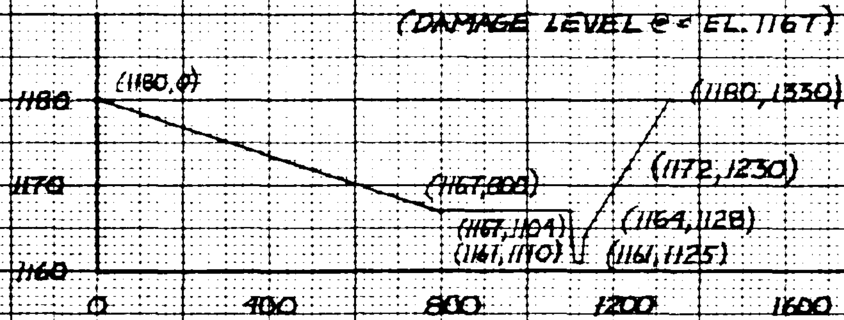
SUBJECT BEAVER POND DAM
BY DTS DATE 8-27-81 SHEET NO. 17 OF 20
CHKD. BY PLA DATE 2-4-81 PROJECT NO. 80-238-403

DOWNSTREAM ROUTING SECTION

– SECTION I, 500 FT D.S. OF BEAVER DAM

INVERT = 1161.0
CHANNEL SLOPE = 0.010
$n_{LOB} = 0.070$; $n_{ROB} = 0.080$
$n_{CH} = 0.035$

(DAMAGE LEVEL @ ≈ EL. 1167)



NOTE: SECTION BASED ON FIELD NOTES AND OBSERVATIONS AND USGS TOPO QUAD – EDGEMERE, PA. ELEVATIONS ARE CONSIDERED ESTIMATES, AND ARE NOT NECESSARILY ACCURATE.

SUBJECT DAM SAFETY INSPECTION

BEAVER POND DAM

BY DJS DATE 2-27-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 18 OF 20

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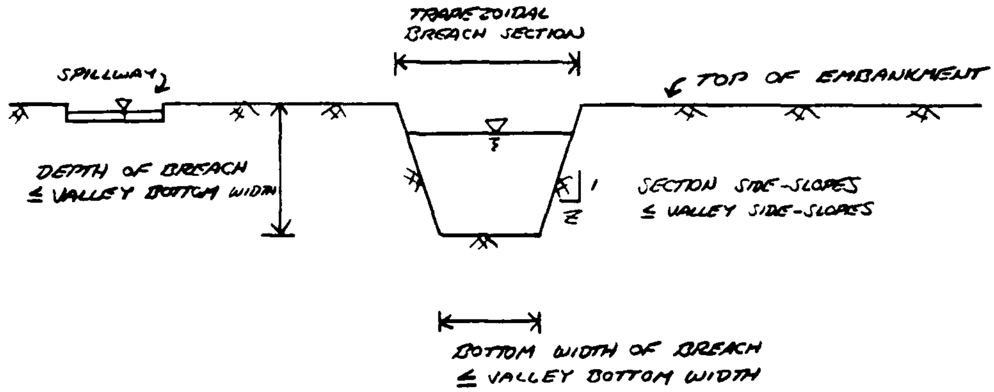
BREACH ASSUMPTIONS

TYPICAL BREACH SECTION:



HEC-1 BREACHING ANALYSIS INPUT:

PLAN	BREACH BOTTOM WIDTH (FT)	MAX. BREACH DEPTH (FT)	SECTION SIDE-SLOPES	BREACH TIME (HRS)	WSEL @ START OF FAILURE (FT)
① MIN. BREACH SECTION, MIN. FAIL TIME	10	12.4	1H:1V	0.5	1177.4
② MAX. BREACH SECTION, MIN. FAIL TIME	40	12.4	10:1	0.5	1177.4
③ MIN BREACH SECTION MAX FAIL TIME	10	12.4	1:1	3.0	1177.4
④ MAX BREACH SECTION MAX. FAIL TIME	40	12.4	10:1	3.0	1177.4
⑤ AVERAGE POSSIBLE CONDITIONS	20	12.4	1:1	1.0	1177.4

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 2-27-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-4-81 SHEET NO. 19 OF 20

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THE BREACH ASSUMPTIONS LISTED ON THE PRECEDING SHEET ARE BASED ON THE SUGGESTED RANGES PROVIDED BY THE C.O.E. (BALTIMORE DISTRICT), AND ON THE PHYSICAL CONSTRAINTS OF THE DAM AND SURROUNDING TERRAIN:

- DEPTH OF BREACH OPENING = 12.4 FT (TOP OF DAM TO MINIMUM RESERVOIR ELEVATION)

- LENGTH OF BREACHABLE EMBANKMENT ≅ 285 FT (FIELD MEASURED)

- VALLEY BOTTOM WIDTH ≅ 150 FT (FIELD OBSERVATION; THE SPILLWAY CREST IS 110 FT LONG, ∴ MAXIMUM BREACH BOTTOM WIDTH FOR HEC-1 INPUT ≅ 40 FT.)

- VALLEY SIDE-SLOPES ADJACENT TO DAM:

RIGHT SIDE: 10 H : 1 V
LEFT SIDE: 10 H : 1 V
(FIELD SURVEY AND USGS TOPO QUAD, EDGEMERE, PA)

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-4-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-5-81 SHEET NO. 20 OF 20

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HEC-1 DAM BREACHING ANALYSIS OUTPUT

BEAVER DAM DATA: (UNDER 0.43 PMF CONDITIONS)

PLAN	VARIABLE BREACH BOTTOM WIDTH (FT)	ACTUAL MAX. FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK (HRS)	INTERPOLATED OR HEC-1 ROUTED MAX. FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK (HRS)	ACTUAL PEAK FLOW THROUGH DAM (CFS)	CORRESPONDING TIME OF PEAK (HRS)	TIME OF INITIAL BREACH (HRS)
1	10	6490	42.17	6490	42.17	6490	42.17	41.67
2	40	8701	42.17	8701	42.17	8701	42.17	41.67
3	10	5579	42.28	5578	42.33	5579	42.28	41.67
4	40	5761	42.44	5761	42.50	5761	42.44	41.67
5	20	6173	42.67	6173	42.67	6173	42.67	41.67

(NON-BREACH 0.43 PMF PEAK OUTFLOW = 5535 CFS)

DOWNSTREAM ROUTING DATA: (UNDER 0.43 PMF CONDITIONS)

OUTPUT @ SECTION 1; 500 FT D.S FROM DAM:

PLAN	VARIABLE BREACH BOTTOM WIDTH (FT)	PEAK* FLOW (CFS)	CORRESPONDING* W.S EL. (FT)	W.S. EL.* w/o BREACH (FT)	ELEVATION DIFFERENCE (FT)
1	10	6433	1169.4	1169.1	+0.3
2	40	8645	1170.0	1169.1	+0.9
3	10	5579	1169.1	1169.1	0.0
4	40	5760	1169.2	1169.1	+0.1
5	20	6166	1169.3	1169.1	+0.2

(NON-BREACH 0.43 PMF PEAK OUTFLOW = 5533 CFS)

* FROM SUMMARY INPUT/OUTPUT SHEETS, SHEET R.

NOTE: DAMAGE LEVEL OF NEARBY STRUCTURES @ SECTION 1 = 1167 FT.

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 7-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. A OF R

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SUMMARY INPUT/OUTPUT SHEETS

OVERTOPPING ANALYSIS

DAM SAFETY INSPECTION
BEAVER DAM, W/U.S. LAKE RENE AND MARCEL LAKE DAMS- OVERTOPPING ANALYSIS
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1
RTIOS= .10 .40 .50 .60 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

LAKE RENE INFLOW HYDROGRAPHS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RENE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.60	0.00	7.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

INITIAL & CONSTANT RAINFALL LOSSES, AS PER C.O.E.

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.71 CP= .45 NTA= 0

BASE FLOW PARAMETERS AS PER C.O.E.

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=10.88 AND R=16.18 INTERVALS

UNIT HYDROGRAPH 92 END-OF-PERIOD ORDINATES, LAG= 1.72 HOURS, CP= .45 VOL= 1.00

7.	28.	57.	91.	129.	170.	208.	238.	261.	275.
277.	267.	251.	236.	222.	208.	196.	184.	173.	163.
153.	144.	135.	127.	119.	112.	106.	99.	93.	88.
82.	77.	73.	68.	64.	61.	57.	53.	50.	47.
44.	42.	39.	37.	35.	33.	31.	29.	27.	25.
24.	22.	21.	20.	19.	18.	17.	16.	15.	14.
13.	12.	11.	11.	10.	9.	9.	8.	8.	7.
7.	7.	6.	6.	5.	5.	5.	5.	4.	4.
4.	4.	3.	3.	3.	3.	3.	2.	2.	2.
2.	2.								

	RAIN	EXCS	LOSS	COMP Q
SUM	24.99	22.60	2.39	130308.
	(635.)(	574.)(	61.)(	3689.91)

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. B OF R

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LOCAL INFLOW HYDROGRAPHS, LAKE RENE

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1043.	757.	266.	138.	39011.
CMS	30.	21.	8.	4.	1105.
INCHES		4.40	6.19	6.30	6.30
MM		111.81	157.25	160.02	160.02
AC-FT		375.	528.	537.	537.
THOUS CU M		463.	651.	663.	663.

0.4PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1390.	1010.	355.	181.	52014.
CMS	39.	29.	10.	5.	1473.
INCHES		5.87	8.25	8.40	8.40
MM		149.10	209.67	213.37	213.37
AC-FT		501.	704.	716.	716.
THOUS CU M		618.	868.	884.	884.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1738.	1262.	444.	226.	65018.
CMS	49.	36.	13.	6.	1841.
INCHES		7.34	10.32	10.50	10.50
MM		186.38	262.09	266.71	266.71
AC-FT		626.	880.	896.	896.
THOUS CU M		772.	1086.	1105.	1105.

0.6 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2085.	1514.	532.	271.	78021.
CMS	59.	43.	15.	8.	2209.
INCHES		8.81	12.38	12.60	12.60
MM		223.65	314.51	320.05	320.05
AC-FT		751.	1056.	1075.	1075.
THOUS CU M		926.	1303.	1326.	1326.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3475.	2524.	887.	452.	130036.
CMS	98.	71.	25.	13.	3682.
INCHES		14.68	20.64	21.00	21.00
MM		372.75	524.18	533.42	533.42
AC-FT		1252.	1760.	1791.	1791.
THOUS CU M		1544.	2171.	2209.	2209.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE THROUGH LAKE RENE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RENE	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1260.	-1

STAGE	1260.00	1261.00	1262.00	1263.00	1264.00	1265.00	1266.00	1267.00
FLOW	0.00	182.00	513.00	943.00	1452.00	2029.00	5457.00	11253.00
CAPACITY=	0.	79.	158.	237.	316.	395.	474.	553.
ELEVATION	1260.	1261.	1262.	1263.	1264.	1265.	1266.	1267.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1260.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SUBJECT DAM SAFETY INSPECTION

BEAVER POND DAM

BY DJJ DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. C OF R

CONSULTANTS, INC.

Engineers • Geologists • Planners
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LAKE RENE
OUTFLOW
HYDROGRAPHS

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	725.	608.	204.	104.	29823.
CMS	21.	17.	6.	3.	844.
INCHES		3.53	4.75	4.82	4.82
MM		89.77	120.77	122.34	122.34
AC-FT		301.	406.	411.	411.
THOUS CU M		372.	500.	507.	507.

0.4PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1006.	839.	282.	143.	41055.
CMS	28.	24.	8.	4.	1163.
INCHES		4.88	6.55	6.63	6.63
MM		123.93	166.32	168.41	168.41
AC-FT		416.	558.	565.	565.
THOUS CU M		513.	689.	698.	698.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1299.	1073.	361.	182.	52549.
CMS	37.	30.	10.	5.	1488.
INCHES		6.24	8.38	8.49	8.49
MM		158.52	212.95	215.56	215.56
AC-FT		532.	715.	724.	724.
THOUS CU M		657.	882.	893.	893.

0.6PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1596.	1309.	440.	223.	64145.
CMS	45.	37.	12.	6.	1816.
INCHES		7.61	10.24	10.36	10.36
MM		193.34	259.99	263.13	263.13
AC-FT		649.	873.	884.	884.
THOUS CU M		801.	1077.	1090.	1090.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3279.	2296.	768.	388.	111887.
CMS	93.	65.	22.	11.	3168.
INCHES		13.35	17.86	18.07	18.07
MM		339.13	453.74	458.97	458.97
AC-FT		1139.	1524.	1541.	1541.
THOUS CU M		1405.	1879.	1901.	1901.

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SUB-AREA RUNOFF COMPUTATION

MARCEL LAKE INFLOW HYDROGRAPHS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
MARCEL	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.70	0.00	7.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

SUBJECT DAM SAFETY INSPECTION

BEAVER POND DAM

BY DJJ DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLA DATE 3-10-81 SHEET NO. D OF R

GAI CONSULTANTS, INC

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LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.75 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=11.07 AND R=16.60 INTERVALS

UNIT HYDROGRAPH 94 END-OF-PERIOD ORDINATES, LAG= 1.76 HOURS, CP= .45 VOL= 1.00

12.	44.	91.	146.	208.	273.	335.	387.	425.	451.
459.	445.	419.	395.	372.	350.	330.	310.	292.	275.
259.	244.	230.	216.	204.	192.	180.	170.	160.	151.
142.	133.	126.	118.	111.	105.	99.	93.	88.	82.
78.	73.	69.	65.	61.	57.	54.	51.	48.	45.
42.	40.	38.	35.	33.	31.	30.	28.	26.	25.
23.	22.	21.	19.	18.	17.	16.	15.	14.	14.
13.	12.	11.	11.	10.	9.	9.	8.	8.	7.
7.	7.	6.	6.	5.	5.	5.	5.	4.	4.
4.	4.	3.	3.						

	RAIN	EXCS	LOSS	COMP Q
SUM	24.99	22.60	2.39	218906.
	(635.)	(574.)	(61.)	(6198.73)

LOCAL INFLOW HYDROGRAPHS, MARCEL LAKE.

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1734.	1269.	441.	228.	65523.
CMS	49.	36.	13.	6.	1855.
INCHES		4.37	6.16	6.27	6.27
MM		111.02	156.57	159.28	159.28
AC-FT		629.	887.	903.	903.
THOUS CU M		776.	1094.	1113.	1113.

0.4PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2313.	1692.	596.	303.	87363.
CMS	65.	48.	17.	9.	2474.
INCHES		5.83	8.22	8.36	8.36
MM		148.03	208.70	212.37	212.37
AC-FT		839.	1183.	1203.	1203.
THOUS CU M		1035.	1459.	1484.	1484.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2891.	2114.	745.	379.	109204.
CMS	82.	60.	21.	11.	3092.
INCHES		7.28	10.27	10.45	10.45
MM		185.04	260.87	265.46	265.46
AC-FT		1048.	1478.	1504.	1504.
THOUS CU M		1293.	1823.	1855.	1855.

SUBJECT: DAM SAFETY INSPECTION
BEAVER POND DAM

BY: DJS DATE: 3-9-81 PROJ. NO.: 80-238-408
CHKD. BY: DLB DATE: 3-10-81 SHEET NO.: E OF R

GAI CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

0.6 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3469.	2537.	894.	455.	131045.
CMS	98.	72.	25.	13.	3711.
INCHES		8.74	12.32	12.54	12.54
MM		222.05	313.05	318.55	318.55
AC-FT		1258.	1774.	1805.	1805.
THOUS CU M		1552.	2188.	2226.	2226.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5781.	4229.	1491.	758.	218409.
CMS	164.	120.	42.	21.	6185.
INCHES		14.57	20.54	20.90	20.90
MM		370.08	521.75	530.92	530.92
AC-FT		2097.	2956.	3008.	3008.
THOUS CU M		2587.	3647.	3711.	3711.

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COMBINE HYDROGRAPHS

COMBINE LAKE RENE OUTFLOW HYDROGRAPH WITH MARCEL LAKE INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
MARCEL	2	0	0	0	0	1	0	0

SUM OF MARCEL LAKE LOCAL INFLOW HYDROGRAPH AND LAKE RENE OUTFLOW HYDROGRAPH.

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2249.	1810.	652.	331.	95346.
CMS	64.	51.	18.	9.	2700.
INCHES		3.92	5.64	5.73	5.73
MM		99.45	143.22	145.53	145.53
AC-FT		897.	1292.	1313.	1313.
THOUS CU M		1107.	1594.	1620.	1620.

0.4PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3060.	2451.	878.	446.	128418.
CMS	87.	69.	25.	13.	3636.
INCHES		5.30	7.60	7.72	7.72
MM		134.66	192.93	196.01	196.01
AC-FT		1215.	1741.	1769.	1769.
THOUS CU M		1499.	2148.	2182.	2182.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3885.	3097.	1106.	562.	161754.
CMS	110.	88.	31.	16.	4580.
INCHES		6.70	9.57	9.72	9.72
MM		170.19	243.04	246.89	246.89
AC-FT		1536.	2193.	2228.	2228.
THOUS CU M		1894.	2705.	2748.	2748.

0.6 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4712.	3747.	1334.	678.	195190.
CMS	133.	106.	38.	19.	5527.
INCHES		8.11	11.55	11.73	11.73
MM		205.90	293.31	297.93	297.93
AC-FT		1858.	2647.	2689.	2689.
THOUS CU M		2292.	3265.	3316.	3316.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8855.	6417.	2259.	1147.	330295.
CMS	251.	182.	64.	32.	9353.
INCHES		13.88	19.55	19.85	19.85
MM		352.63	496.44	504.15	504.15
AC-FT		3182.	4480.	4550.	4550.
THOUS CU M		3925.	5526.	5612.	5612.

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. F OF R

GAI CONSULTANTS, INC.
Engineers • Geologists • Planners
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HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGRAPH THROUGH MARCEL LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
MARCEL	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1231.	-1

STAGE	1231.00	1232.00	1233.00	1234.00	1235.00	1236.00	1236.50	1237.50	1238.50
FLOW	0.00	222.00	628.00	1154.00	1776.00	2482.00	2863.00	4609.00	8120.00

SURFACE AREA=	0.	27.	37.	78.
CAPACITY=	0.	144.	431.	1556.
ELEVATION=	1215.	1231.	1240.	1260.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
1231.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1236.5	0.0	0.0	0.

MARCEL LAKE
OUTFLOW
HYDROGRAPHS

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2198.	1781.	620.	314.	90552.
CMS	62.	50.	18.	9.	2564.
INCHES		3.85	5.36	5.44	5.44
MM		97.87	136.21	138.21	138.21
AC-FT		883.	1229.	1247.	1247.
THOUS CU M		1089.	1516.	1538.	1538.

0.4PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3033.	2418.	840.	426.	122650.
CMS	86.	68.	24.	12.	3473.
INCHES		5.23	7.27	7.37	7.37
MM		132.84	184.54	187.21	187.21
AC-FT		1199.	1665.	1689.	1689.
THOUS CU M		1479.	2054.	2084.	2084.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3872.	3061.	1062.	539.	155099.
CMS	110.	87.	30.	15.	4392.
INCHES		6.62	9.19	9.32	9.32
MM		168.20	233.40	236.73	236.73
AC-FT		1518.	2106.	2136.	2136.
THOUS CU M		1872.	2598.	2635.	2635.

0.6 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4708.	3708.	1285.	652.	187669.
CMS	133.	105.	36.	18.	5315.
INCHES		8.02	11.12	11.28	11.28
MM		203.73	282.48	286.48	286.48
AC-FT		1839.	2549.	2585.	2585.
THOUS CU M		2268.	3144.	3189.	3189.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8830.	6401.	2193.	1111.	320091.
CMS	250.	181.	62.	31.	9064.
INCHES		13.85	18.97	19.24	19.24
MM		351.72	481.91	488.57	488.57
AC-FT		3174.	4349.	4409.	4409.
THOUS CU M		3915.	5364.	5438.	5438.

SUBJECT: DAM SAFETY INSPECTION
BEAVER POND DAM

BY: DJS DATE: 3-9-81 PROJ. NO. 80-238-408
CHKD. BY: DLB DATE: 3-10-81 SHEET NO. G OF R

GAI CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

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                    SUB-AREA RUNOFF COMPUTATION

   BEAVER DAM RESERVOIR INFLOW HYDROGRAPHS

              ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
             BEAVER       0       0       0       0       0       1       0       0

                                      HYDROGRAPH DATA
      IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
          1       1    2.70    0.00    7.00    0.00   0.000       0       1       0

                                        PRECIP DATA
                 SPFE     PMS      R6     R12     R24     R48     R72     R96
                 0.00   22.00  111.00  123.00  133.00  142.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS  .800

                                         LOSS DATA
        LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
            0    0.00    0.00    1.00    0.00    0.00    1.00    1.00     .05    0.00    0.00

                                    UNIT HYDROGRAPH DATA
                               TP=  1.95     CP= .45     NTA=  0

                                       RECESSION DATA
                        STRTQ=   -1.50     QRCSN=    -.05    RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=12.23 AND R=18.52 INTERVALS

       UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG=  1.95 HOURS, CP=  .45   VOL=  .99
     9.       34.       71.      114.      162.      215.      268.      316.      355.      385.
   405.      413.      404.      384.      363.      344.      326.      309.      293.      277.
   263.      249.      236.      224.      212.      201.      190.      180.      171.      162.
   153.      145.      137.      130.      123.      117.      111.      105.       99.       94.
    89.       85.       80.       76.       72.       68.       65.       61.       58.       55.
    52.       49.       47.       44.       42.       40.       38.       36.       34.       32.
    30.       29.       27.       26.       24.       23.       22.       21.       20.       19.
    18.       17.       16.       15.       14.       13.       13.       12.       11.       11.
    10.       10.        9.        9.        8.        8.        7.        7.        7.        6.
     6.        6.        5.        5.        5.        5.        4.        4.        4.        4.

                          RAIN   EXCS   LOSS    COMP Q
                     SUM  24.99  22.60   2.39  213849.
                        ( 635.)( 574.)(  61.)( 6055.53)
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LOCAL INFLOW HYDROGRAPHS, BEAVER POND DAM.

0.3PMF

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                  PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
         CFS     1631.     1227.      437.      222.        63981.
         CMS       46.       35.       12.        6.         1812.
      INCHES                4.23      6.02      6.12          6.12
          MM              107.37    152.87    155.53        155.53
       AC-FT                608.      866.      881.          881.
  THOUS CU M                750.     1068.     1087.         1087.
```

0.4 PMF

```
                  PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
         CFS     2174.     1636.      582.      296.        85309.
         CMS       62.       46.       16.        8.         2416.
      INCHES                5.64      8.02      8.16          8.16
          MM              143.16    203.82    207.37        207.37
       AC-FT                811.     1155.     1175.         1175.
  THOUS CU M               1001.     1425.     1449.         1449.
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SUBJECT: DAM SAFETY INSPECTION
BEAVER POND DAM

BY: DJJ DATE: 3-9-81 PROJ. NO. 80-238-408

CHKD. BY: DLB DATE: 3-10-81 SHEET NO. 4 OF R

GAI CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2718.	2045.	728.	370.	106636.
CMS	77.	58.	21.	10.	3020.
INCHES		7.05	10.03	10.21	10.21
MM		178.94	254.78	259.22	259.22
AC-FT		1014.	1444.	1469.	1469.
THOUS CU M		1251.	1781.	1812.	1812.

0.6PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3261.	2454.	873.	444.	127963.
CMS	92.	69.	25.	13.	3624.
INCHES		8.45	12.04	12.25	12.25
MM		214.73	305.73	311.06	311.06
AC-FT		1217.	1732.	1763.	1763.
THOUS CU M		1501.	2137.	2174.	2174.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5436.	4090.	1456.	741.	213271.
CMS	154.	116.	41.	21.	6039.
INCHES		14.09	20.06	20.41	20.41
MM		357.89	509.56	518.43	518.43
AC-FT		2028.	2887.	2938.	2938.
THOUS CU M		2501.	3561.	3624.	3624.

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CUMBINE HYDROGRAPHS

CUMBINE MARCEL LAKE OUTFLOW HYDROGRAPH W/BEAVER DAM INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BEAVER	2	0	0	0	0	1	0	0

SUM OF BEAVER POND LOCAL INFLOW HYDROGRAPH AND MARCEL LAKE OUTFLOW HYDROGRAPH.

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3732.	2981.	1056.	537.	154533.
CMS	106.	84.	30.	15.	4376.
INCHES		3.96	5.62	5.70	5.70
MM		100.63	142.64	144.89	144.89
AC-FT		1478.	2095.	2129.	2129.
THOUS CU M		1824.	2585.	2626.	2626.

0.4PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5107.	4021.	1422.	722.	207958.
CMS	145.	114.	40.	20.	5889.
INCHES		5.34	7.56	7.68	7.68
MM		135.73	191.98	194.99	194.99
AC-FT		1994.	2820.	2864.	2864.
THOUS CU M		2459.	3479.	3533.	3533.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6513.	5070.	1770.	909.	261734.
CMS	184.	144.	51.	26.	7411.
INCHES		6.74	9.51	9.66	9.66
MM		171.12	241.65	245.41	245.41
AC-FT		2514.	3550.	3605.	3605.
THOUS CU M		3101.	4379.	4447.	4447.

0.6 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7900.	6123.	2159.	1096.	315651.
CMS	224.	173.	61.	31.	8938.
INCHES		8.14	11.47	11.65	11.65
MM		206.68	291.45	295.96	295.96
AC-FT		3036.	4282.	4348.	4348.
THOUS CU M		3745.	5281.	5363.	5363.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	14216.	10468.	3648.	1852.	533362.
CMS	403.	296.	103.	52.	15103.
INCHES		13.91	19.39	19.69	19.69
MM		353.35	492.57	500.09	500.09
AC-FT		5191.	7236.	7347.	7347.
THOUS CU M		6401.	8926.	9062.	9062.

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJJ DATE 3-9-81 PROJ. NO. 80-238-408
CHKD. BY DLB DATE 3-10-81 SHEET NO. I OF R

GEI CONSULTANTS, INC.
Engineers • Geologists • Planners
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HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGRAPH THROUGH BEAVER DAM RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BEAVER	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-61.	-1

STAGE	1172.00	1173.00	1174.00	1175.00	1176.00	1176.40	1177.00	1177.40	1177.60
	1177.90	1178.00	1178.50	1179.00	1180.00	1181.00	1182.00		
FLOW	0.00	350.00	1020.00	1970.00	3120.00	3670.00	4530.00	5150.00	5310.00
	6110.00	6340.00	7800.00	9620.00	13850.00	18650.00	24370.00		

CAPACITY=		61.	90.	123.	150.	162.	205.	256.	351.
ELEVATION=	1165.	1172.	1174.	1176.	1177.	1178.	1180.	1182.	1185.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
172.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1177.4	0.0	0.0	0.

BEAVER POND
DAM OUTFLOW
HYDROGRAPHS

0.3PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3725.	2976.	1041.	529.	152210.
CMS	105.	84.	29.	15.	4310.
INCHES		3.95	5.53	5.62	5.62
MM		100.45	140.55	142.71	142.71
AC-FT		1476.	2065.	2097.	2097.
THOUS CU M		1820.	2547.	2586.	2586.

0.4PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5092.	4016.	1403.	712.	205157.
CMS	144.	114.	40.	20.	5809.
INCHES		5.34	7.46	7.57	7.57
MM		135.56	189.48	192.36	192.36
AC-FT		1991.	2784.	2826.	2826.
THOUS CU M		2456.	3433.	3486.	3486.

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6509.	5064.	1768.	897.	258473.
CMS	184.	143.	50.	25.	7319.
INCHES		6.73	9.40	9.54	9.54
MM		170.92	238.75	242.35	242.35
AC-FT		2511.	3507.	3560.	3560.
THOUS CU M		3097.	4326.	4391.	4391.

0.6PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7899.	6116.	2135.	1083.	312004.
CMS	224.	173.	60.	31.	8835.
INCHES		8.13	11.35	11.52	11.52
MM		206.46	288.22	292.54	292.54
AC-FT		3033.	4234.	4298.	4298.
THOUS CU M		3741.	5223.	5301.	5301.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	14195.	10465.	3616.	1835.	528353.
CMS	402.	296.	102.	52.	14961.
INCHES		13.91	19.22	19.50	19.50
MM		353.23	488.20	495.39	495.39
AC-FT		5189.	7172.	7278.	7278.
THOUS CU M		6401.	8846.	8977.	8977.

SUBJECT: DAM SAFETY INSPECTION
BEAVER POND DAM

BY: DJS DATE: 3-9-81 PROJ. NO.: 80-238-408
CHKD. BY: DLB DATE: 3-10-81 SHEET NO.: J OF R

GAI CONSULTANTS, INC.
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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

				RATIOS APPLIED TO FLOWS				
OPERATION	STATION	AREA	PLAN	RATIO 1 .30	RATIO 2 .40	RATIO 3 .50	RATIO 4 .60	RATIO 5 1.00
HYDROGRAPH AT	RENE	1.60	1	1043.	1390.	1738.	2085.	3475.
		(4.14)		(29.52)(	39.36)(	49.21)(	59.05)(	98.41)(
ROUTED TO	RENE	1.60	1	725.	1006.	1299.	1596.	3279.
		(4.14)		(20.52)(	28.47)(	36.79)(	45.19)(	92.86)(
HYDROGRAPH AT	MARCEL	2.70	1	1734.	2313.	2891.	3469.	5781.
		(6.99)		(49.11)(	65.48)(	81.85)(	98.22)(	163.71)(
2 COMBINED	MARCEL	4.30	1	2249.	3060.	3885.	4712.	8855.
		(11.14)		(63.68)(	86.65)(	110.01)(	133.43)(	250.74)(
ROUTED TO	MARCEL	4.30	1	2198.	3031.	3872.	4708.	8836.
		(11.14)		(62.25)(	85.82)(	109.63)(	133.30)(	250.20)(
HYDROGRAPH AT	BEAVER	2.70	1	1631.	2174.	2718.	3261.	5436.
		(6.99)		(46.18)(	61.57)(	76.96)(	92.35)(	153.92)(
2 COMBINED	BEAVER	7.00	1	3732.	5107.	6513.	7900.	14216.
		(18.13)		(105.68)(	144.62)(	184.44)(	223.71)(	402.56)(
ROUTED TO	BEAVER	7.00	1	3725.	5092.	6509.	7899.	14195.
		(18.13)		(105.49)(	144.20)(	184.31)(	223.67)(	401.95)(

OVERTOPPING ANALYSIS SUMMARY:

LAKE RENE DAM

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1260.00	1260.00	1265.00
STORAGE	0.	0.	395.
OUTFLOW	0.	0.	2029.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	1262.49	0.00	197.	725.	0.00	43.50	0.00
.40	1263.17	0.00	247.	1006.	0.00	43.50	0.00
.50	1263.70	0.00	292.	1299.	0.00	43.33	0.00
.60	1264.25	0.00	336.	1596.	0.00	43.17	0.00
1.00	1265.36	.36	424.	3279.	3.17	42.00	0.00

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. K OF R

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MARCEL LAKE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1231.00	1231.00	1236.50
STORAGE	144.	144.	309.
OUTFLOW	0.	0.	2863.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	1235.60	0.00	279.	2198.	0.00	42.67	0.00
.40	1236.80	.10	312.	3031.	1.33	42.50	0.00
.50	1237.08	.58	328.	3872.	3.33	42.33	0.00
.60	1237.53	1.03	341.	4708.	4.67	42.17	0.00
1.00	1238.65	2.15	382.	8836.	7.33	42.00	0.00

BEAVER POND DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1172.00	1172.00	1177.40
STORAGE	61.	61.	150.
OUTFLOW	0.	0.	5150.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	1176.44	0.00	132.	3725.	0.00	42.50	0.00
.40	1177.36	0.00	149.	5092.	0.00	42.33	0.00
.50	1178.06	.66	163.	6509.	3.00	42.00	0.00
.60	1178.53	1.13	173.	7899.	4.17	42.00	0.00
1.00	1180.07	2.67	207.	14195.	6.83	41.83	0.00

OVERTOPPING OCCURS@ = 0.40 PMF

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. 6 OF R

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BREACHING ANALYSIS
(0.43 PMF EVENT)

(INPUT SAME AS FOR OVERTOPPING ANALYSIS, WITH THE ADDITION OF BREACH CRITERIA GIVEN HERE.)

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DAM SAFETY INSPECTION
BEAVER DAM **** BREACHING ANALYSIS ****
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

                                   JOB SPECIFICATION
   NQ      NHR     NMIN     IDAY     IHR     IMIN    METRC     IPLT     IPRT    NSTAN
  288        0       10        0       0        0        0        0        0        0
                           JOPER     NWT    LROPT    TRACE
                               5       0        0        0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                             NPLAN= 6 NRTIO= 1 LRTIO= 1

 RTIOS=     .43

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LAKE RENE INFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1494.	1065.	387.	194.	55915.
CMS	42.	31.	11.	5.	1583.
INCHES		6.31	8.87	9.03	9.03
MM		160.28	225.40	229.37	229.37
AC-FT		538.	757.	770.	770.
THOUS CU M		664.	934.	950.	950.

LAKE RENE OUTFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1095.	909.	305.	154.	44487.
CMS	31.	26.	9.	4.	1260.
INCHES		5.29	7.10	7.18	7.18
MM		134.28	180.24	182.49	182.49
AC-FT		451.	605.	613.	613.
THOUS CU M		556.	747.	756.	756.

MARCEL LAKE LOCAL INFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2486.	1818.	641.	326.	93916.
CMS	70.	51.	18.	9.	2659.
INCHES		6.27	8.83	8.99	8.99
MM		159.13	224.35	228.30	228.30
AC-FT		902.	1271.	1294.	1294.
THOUS CU M		1112.	1568.	1596.	1596.

MARCEL LAKE TOTAL INFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3301.	2644.	946.	481.	138403.
CMS	93.	75.	27.	14.	3919.
INCHES		5.72	8.19	8.32	8.32
MM		145.29	207.94	211.25	211.25
AC-FT		1311.	1876.	1906.	1906.
THOUS CU M		1617.	2315.	2351.	2351.

SUBJECT	DAM SAFETY INSPECTION
	BEAVER POND DAM
BY	DJS
DATE	3-9-81
PROJ. NO.	80-338-408
CHKD. BY	DLB
DATE	3-10-81
SHEET NO.	M OF R

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MARCEL LAKE OUTFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3287.	2610.	906.	460.	132356.
CMS	93.	74.	26.	13.	3748.
INCHES		5.65	7.84	7.95	7.95
MM		143.40	199.15	202.02	202.02
AC-FT		1294.	1797.	1823.	1823.
THOUS CU M		1596.	2217.	2249.	2249.

BEAVER POND LOCAL INFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2337.	1759.	626.	318.	91707.
CMS	66.	50.	18.	9.	2597.
INCHES		6.06	8.63	8.78	8.78
MM		153.89	219.11	222.93	222.93
AC-FT		872.	1242.	1263.	1263.
THOUS CU M		1076.	1531.	1558.	1558.

BEAVER POND TOTAL INFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5546.	4335.	1532.	778.	224063.
CMS	157.	123.	43.	22.	6345.
INCHES		5.76	8.14	8.27	8.27
MM		146.32	206.85	210.08	210.08
AC-FT		2150.	3039.	3086.	3086.
THOUS CU M		2651.	3748.	3807.	3807.

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BEAVER POND OUTFLOWS:

HYDROGRAPH ROUTING

ROUTE TOTAL HYDROGRAPH THROUGH BEAVER DAM RESERVOIR

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1177.4	0.0	0.0	0.

BREACH PLAN:

1

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	1.00	1165.00	.50	1172.00	1177.40

STATION BEAVER, PLAN 1, RATIO 1

BEGIN DAM FAILURE AT 41.67 HOURS

PEAK OUTFLOW IS 6490. AT TIME 42.17 HOURS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
40.	10.00	1165.00	.50	1172.00	1177.40

STATION BEAVER, PLAN 2, RATIO 1

2

BEGIN DAM FAILURE AT 41.67 HOURS

PEAK OUTFLOW IS 8701. AT TIME 42.17 HOURS

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. N OF R

GAI CONSULTANTS, INC.
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(3)

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	1.00	1165.00	3.00	1172.00	1177.40

STATION BEAVER, PLAN 3, RATIO 1

BEGIN DAM FAILURE AT 41.67 HOURS

PEAK OUTFLOW IS 5579. AT TIME 42.28 HOURS

(4)

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
40.	10.00	1165.00	3.00	1172.00	1177.40

STATION BEAVER, PLAN 4, RATIO 1

BEGIN DAM FAILURE AT 41.67 HOURS

PEAK OUTFLOW IS 5761. AT TIME 42.44 HOURS

(5)

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
20.	1.00	1165.00	1.00	1172.00	1177.40

STATION BEAVER, PLAN 5, RATIO 1

BEGIN DAM FAILURE AT 41.67 HOURS

PEAK OUTFLOW IS 6173. AT TIME 42.67 HOURS

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. O OF R

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THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .010 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

PLAN ②

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	-	COMPUTED BREACH HYDROGRAPH (CFS)	=	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
41.667	0.000	5247.		5247.		0.	0.	0.
41.676	.010	5325.		5279.		47.	47.	0.
41.686	.020	5404.		5322.		82.	128.	0.
41.696	.029	5482.		5374.		108.	236.	0.
41.706	.039	5561.		5434.		126.	363.	0.
41.716	.049	5639.		5501.		138.	501.	0.
41.725	.059	5718.		5573.		144.	645.	1.
41.735	.069	5796.		5651.		145.	790.	1.
41.745	.078	5874.		5733.		141.	932.	1.
41.755	.088	5953.		5819.		133.	1065.	1.
41.765	.098	6031.		5909.		122.	1187.	1.
41.775	.108	6110.		6002.		107.	1294.	1.
41.784	.118	6188.		6097.		91.	1385.	1.
41.794	.127	6267.		6192.		74.	1460.	1.
41.804	.137	6345.		6289.		56.	1516.	1.
41.814	.147	6423.		6386.		38.	1554.	1.
41.824	.157	6502.		6483.		19.	1572.	1.
41.833	.167	6580.		6580.		0.	1572.	1.
41.843	.176	6664.		6677.		-12.	1560.	1.
41.853	.186	6749.		6772.		-23.	1537.	1.
41.863	.196	6833.		6865.		-32.	1505.	1.
41.873	.206	6917.		695 .		-40.	1465.	1.
41.882	.216	7002.		7054.		-53.	1412.	1.
41.892	.225	7086.		7149.		-63.	1349.	1.
41.902	.235	7170.		7240.		-70.	1279.	1.
41.912	.245	7254.		7329.		-75.	1204.	1.
41.922	.255	7339.		7416.		-77.	1127.	1.
41.931	.265	7423.		7499.		-76.	1051.	1.
41.941	.275	7507.		7579.		-72.	979.	1.
41.951	.284	7591.		7658.		-66.	912.	1.
41.961	.294	7676.		7737.		-62.	851.	1.
41.971	.304	7760.		7814.		-54.	797.	1.
41.980	.314	7844.		7887.		-43.	754.	1.
41.990	.324	7928.		7957.		-28.	725.	1.
42.000	.333	8013.		8013.		0.	725.	1.
42.010	.343	8053.		8066.		-12.	713.	1.
42.020	.353	8094.		8116.		-22.	691.	1.
42.029	.363	8134.		8163.		-29.	661.	1.
42.039	.373	8175.		8208.		-34.	628.	1.
42.049	.382	8215.		8251.		-36.	592.	0.
42.059	.392	8256.		8292.		-36.	556.	0.
42.069	.402	8296.		8333.		-37.	518.	0.
42.078	.412	8337.		8395.		-58.	460.	0.
42.088	.422	8377.		8451.		-74.	386.	0.
42.098	.431	8418.		8504.		-86.	299.	0.
42.108	.441	8458.		8552.		-94.	205.	0.
42.118	.451	8499.		8597.		-98.	107.	0.
42.127	.461	8539.		8638.		-99.	8.	0.
42.137	.471	8579.		8674.		-95.	-87.	-0.
42.147	.480	8620.		8683.		-63.	-150.	-0.
42.157	.490	8660.		8692.		-32.	-182.	-0.
42.167	.500	8701.		8701.		-0.	-182.	-0.

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJJ DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. P OF R

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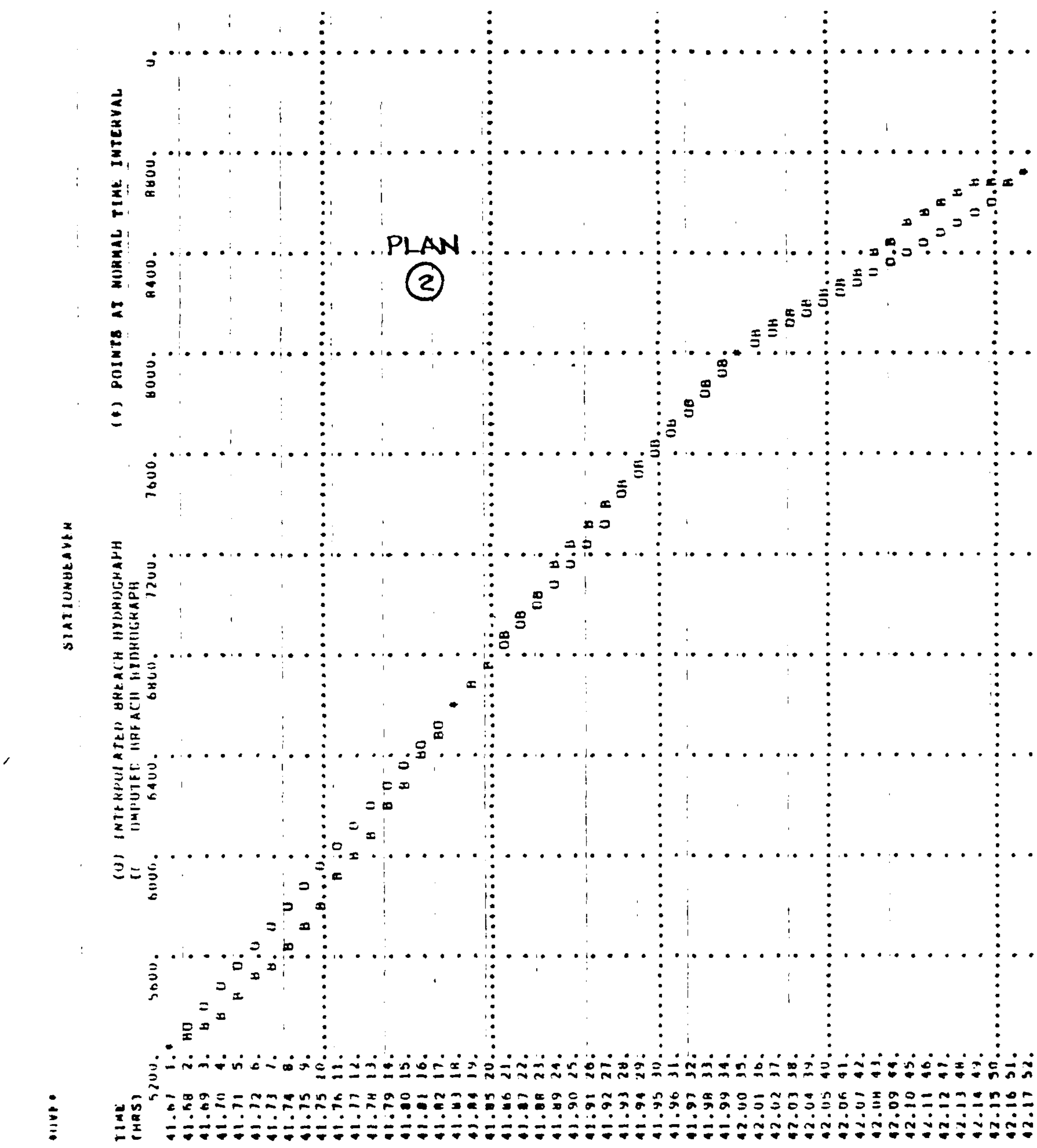

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJJ DATE 3-9-81 PROJ. NO. 80-238-408
CHKD. BY DLB DATE 3-10-81 SHEET NO. Q OF R

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HYDROGRAPH ROUTING

ROUTE FROM BEAVER DAM TO SECTION 1, 500 FT D.S. FROM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BVR-1	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME
ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0
	NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0350	.0800	1161.0	1180.0	500.	.01000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1180.00 800.00 1167.00 1104.00 1167.00 1110.00 1161.00 1125.00 1161.00
1128.00 1164.00 1230.00 1172.00 1330.00 1180.00

STORAGE	0.00	.18	.39	.62	.94	1.42	2.05	6.68	12.17
	25.69	33.73	42.62	52.37	62.96	74.40	86.69	99.83	113.83
OUTFLOW	0.00	63.37	201.78	400.48	680.81	1049.80	1524.80	2843.40	5184.88
	12732.99	18008.32	24355.47	31826.96	40479.70	50370.71	61556.64	74093.53	88036.71
STAGE	1161.00	1162.00	1163.00	1164.00	1165.00	1166.00	1167.00	1168.00	1169.00
	1171.00	1172.00	1173.00	1174.00	1175.00	1176.00	1177.00	1178.00	1179.00
FLOW	0.00	63.37	201.78	400.48	680.81	1049.80	1524.80	2843.40	5184.88
	12732.99	18008.32	24355.47	31826.96	40479.70	50370.71	61556.64	74093.53	88036.71

SUBJECT DAM SAFETY INSPECTION
BEAVER POND DAM

BY DJS DATE 3-9-81 PROJ. NO. 80-238-408

CHKD. BY DLB DATE 3-10-81 SHEET NO. R OF R

GAI CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

SUMMARY OF DAM SAFETY ANALYSIS

LAKE RENE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1260.00	1260.00	1265.00
STORAGE	0.	0.	395.
OUTFLOW	0.	0.	2029.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.43	1263.30	0.00	261.	1095.	0.00	43.33	0.00

MARCEL LAKE DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1231.00	1231.00	1236.50
STORAGE	144.	144.	309.
OUTFLOW	0.	0.	2863.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.43	1236.74	.24	317.	3207.	2.33	42.33	0.00

BEAVER POND DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1172.00	1172.00	1177.40
STORAGE	61.	61.	150.
OUTFLOW	0.	0.	5150.

BREACH PLAN	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1	.43	1177.50	.10	152.	6490.	.42	42.17	41.67
2		1177.48	.08	151.	8701.	.27	42.17	41.67
3		1177.58	.18	154.	5579.	1.17	42.28	41.67
4		1177.54	.14	153.	5761.	.67	42.44	41.67
5		1177.51	.11	152.	6173.	.50	42.67	41.67
NON-BREACH		1177.62	.22	154.	5535.	1.67	42.17	0.00

SECTION 1 @≈ 500 FT D.S. FROM BEAVER DAM

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.43	6433.	1169.4	42.17
2	.43	8645.	1170.0	42.17
3	.43	5579.	1169.1	42.33
4	.43	5760.	1169.2	42.50
5	.43	6166.	1169.3	42.67
NON-BREACH	.43	5533.	1169.1	42.17

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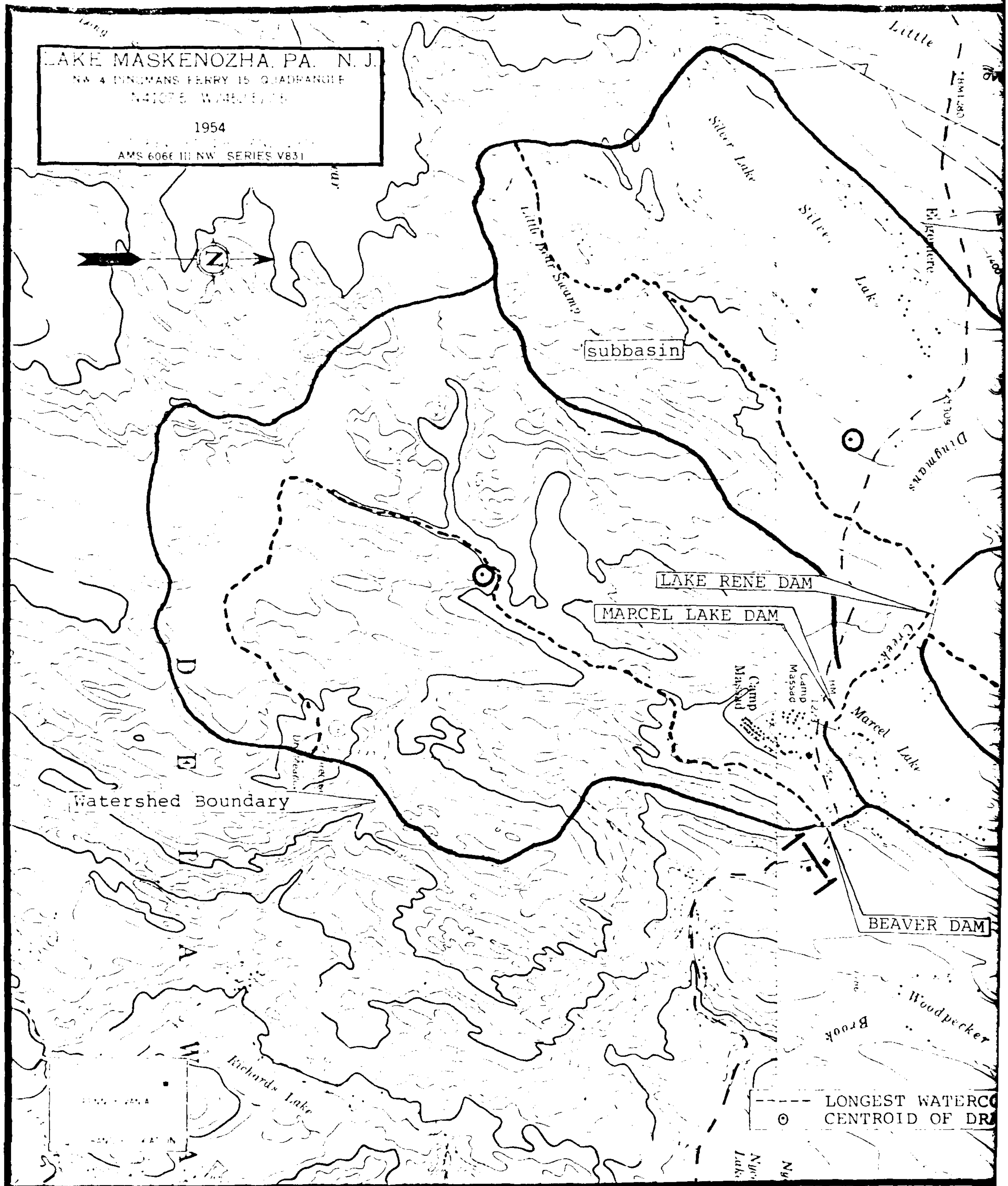
APPENDIX E

FIGURES

LIST OF FIGURES


LAKE MASKENOZHA, PA. N. J.
NW/4 DINGMANS FERRY 15' QUADRANGLE
1954
AMS 6066 III NW - SERIES V831
subbasin
LAKE RENE DAM
MARCEL LAKE DAM
Watershed Boundary
BEAVER DAM
Silver Lake
Marcel Lake
Camp Massad
Dingmans
Creek
Woodpecker
Brook
Richards Lake
LONGEST WATERC
CENTROID OF DR

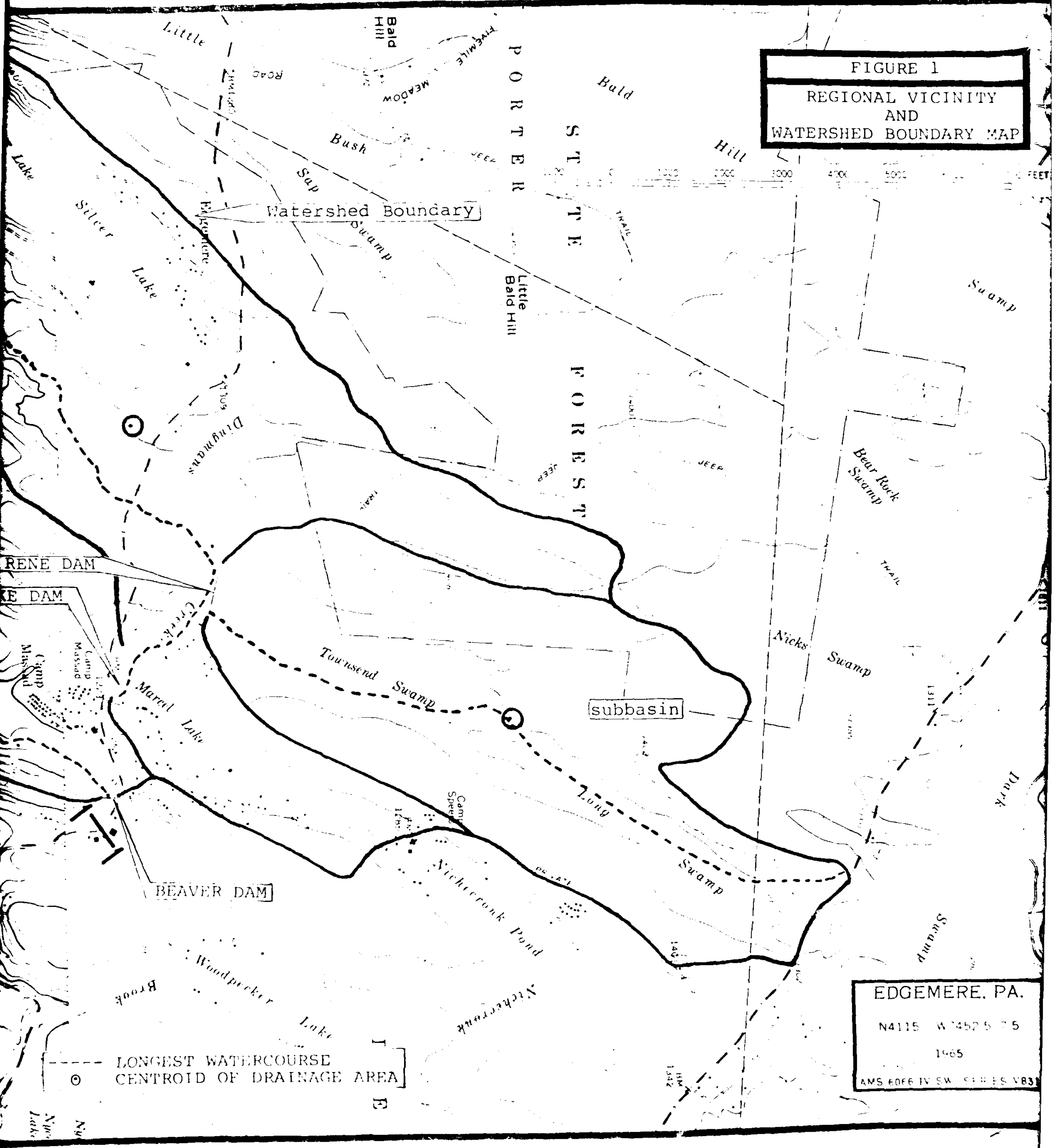
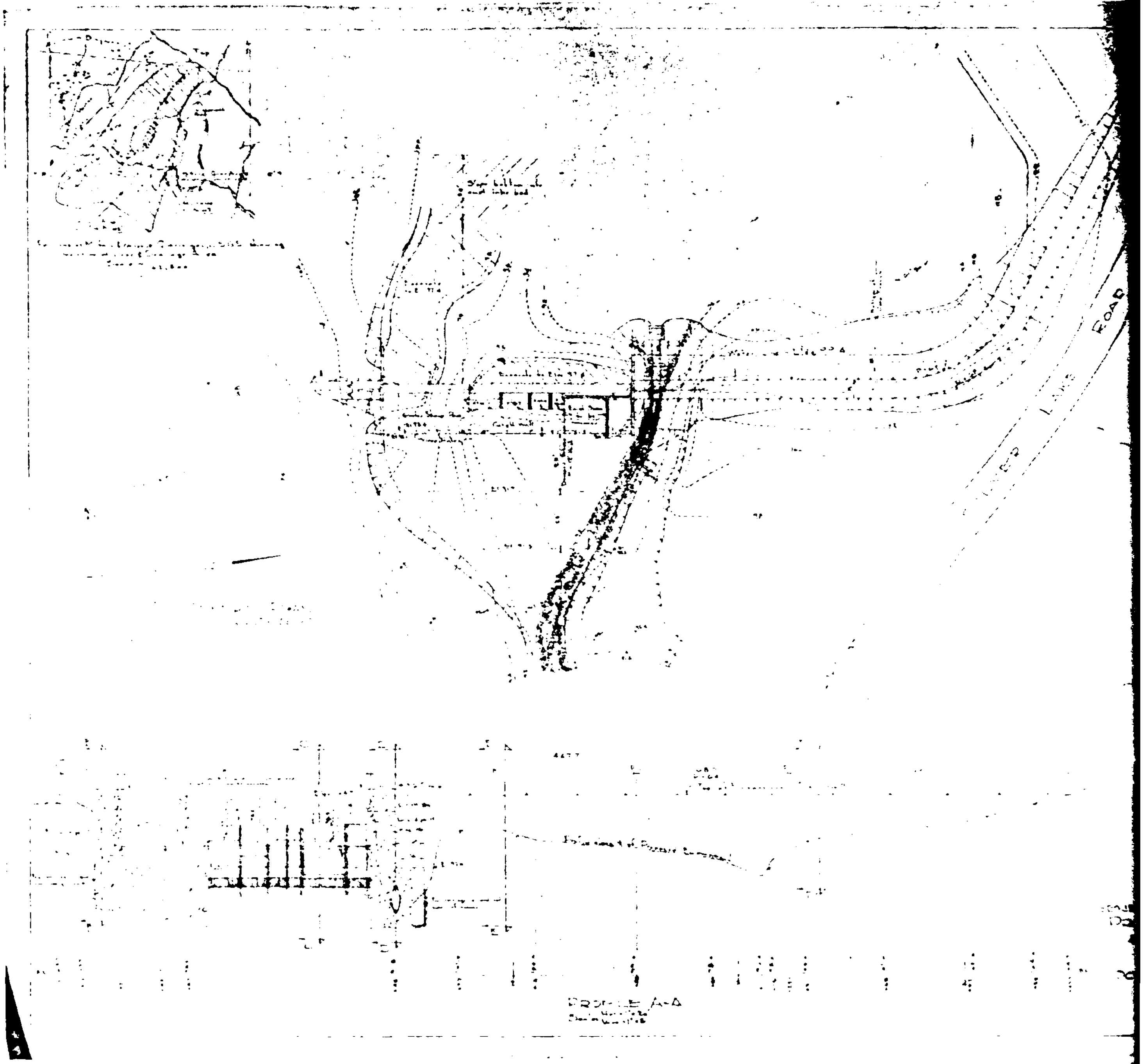


FIGURE 1
REGIONAL VICINITY
AND
WATERSHED BOUNDARY MAP
Watershed Boundary
subbasin
RENE DAM
KE DAM
BEAVER DAM
LONGEST WATERCOURSE
CENTROID OF DRAINAGE AREA
EDGEMERE, PA.
PORTER STATE FOREST
Little Bald Hill
Bald Hill
Bush
Sap Swamp
Silver Lake
Dingmans
Townsend Swamp
Long Swamp
Marcel Lake
Camp Speer
Camp Massad
Nichecronk Pond
Nichecronk
Woodpecker Lake
Brook
Bear Rock Swamp
Nicks Swamp
Swamp
Dark Swamp
Little
Bald Hill
FIVEMILE MEADOW ROAD


ROAD
PROFILE A-A

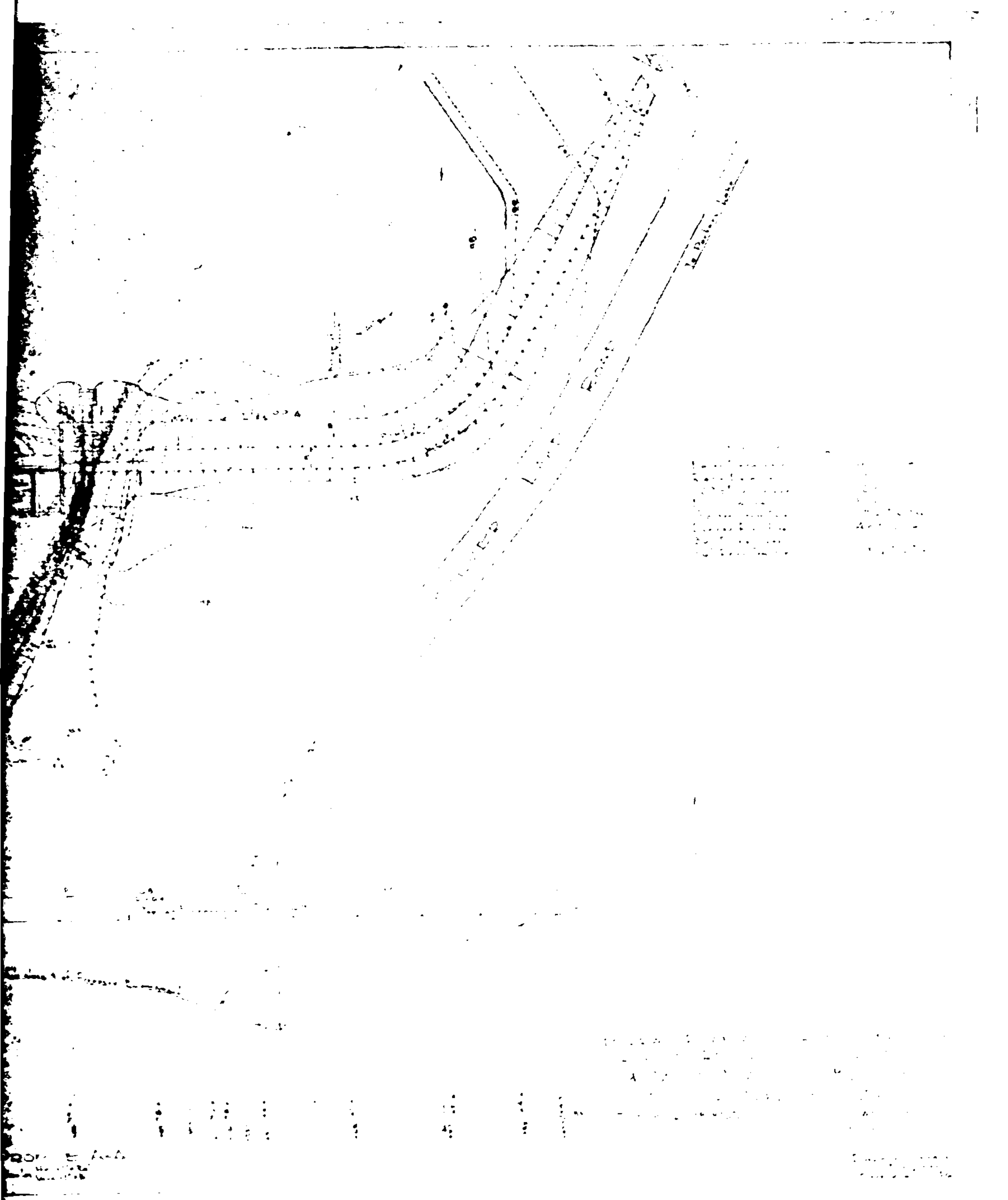


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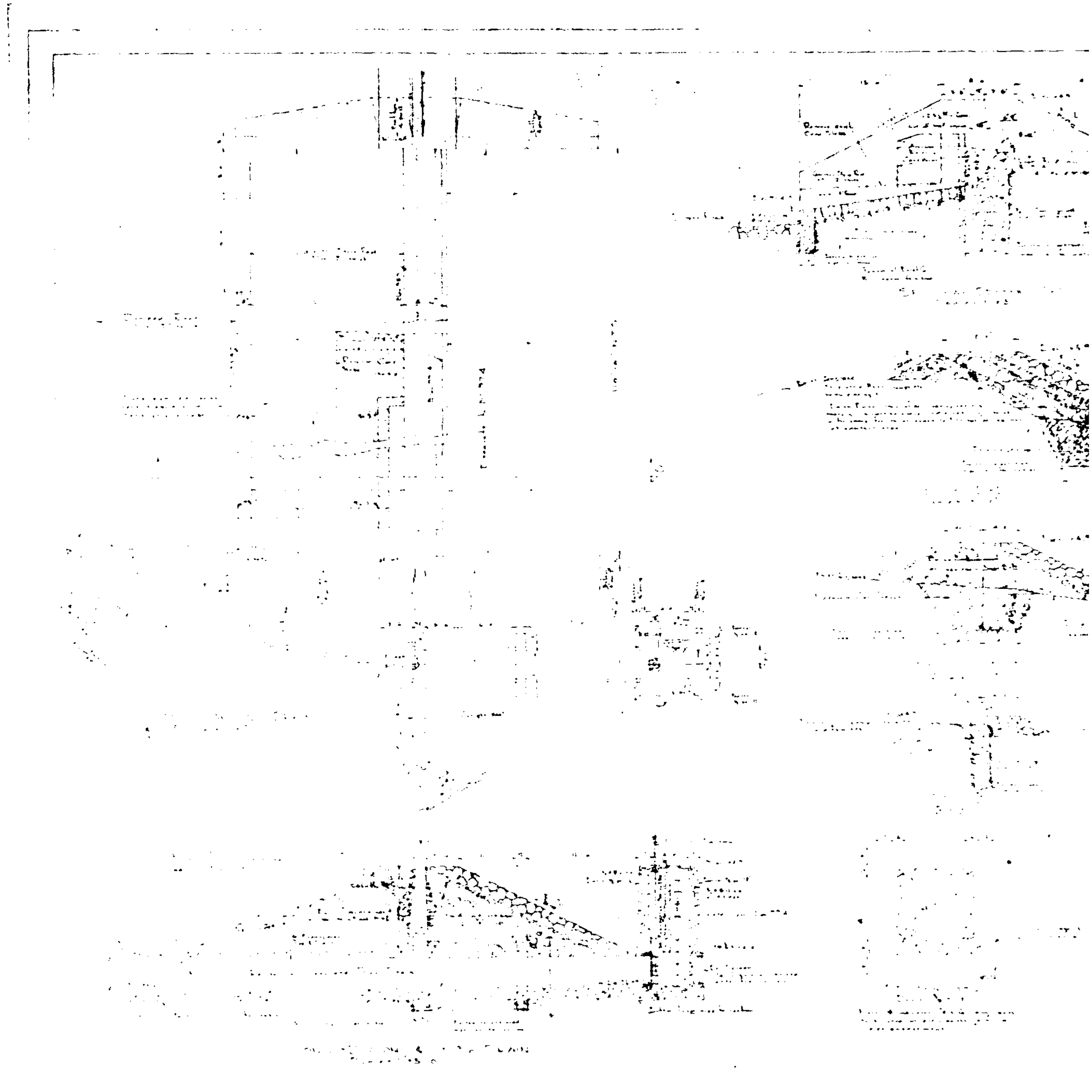
FIGURE 2



AD-A099 089 GAI CONSULTANTS INC MONROEVILLE PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. BEAVER POND DAM (NDI I.D. NUMB--ETC(U)
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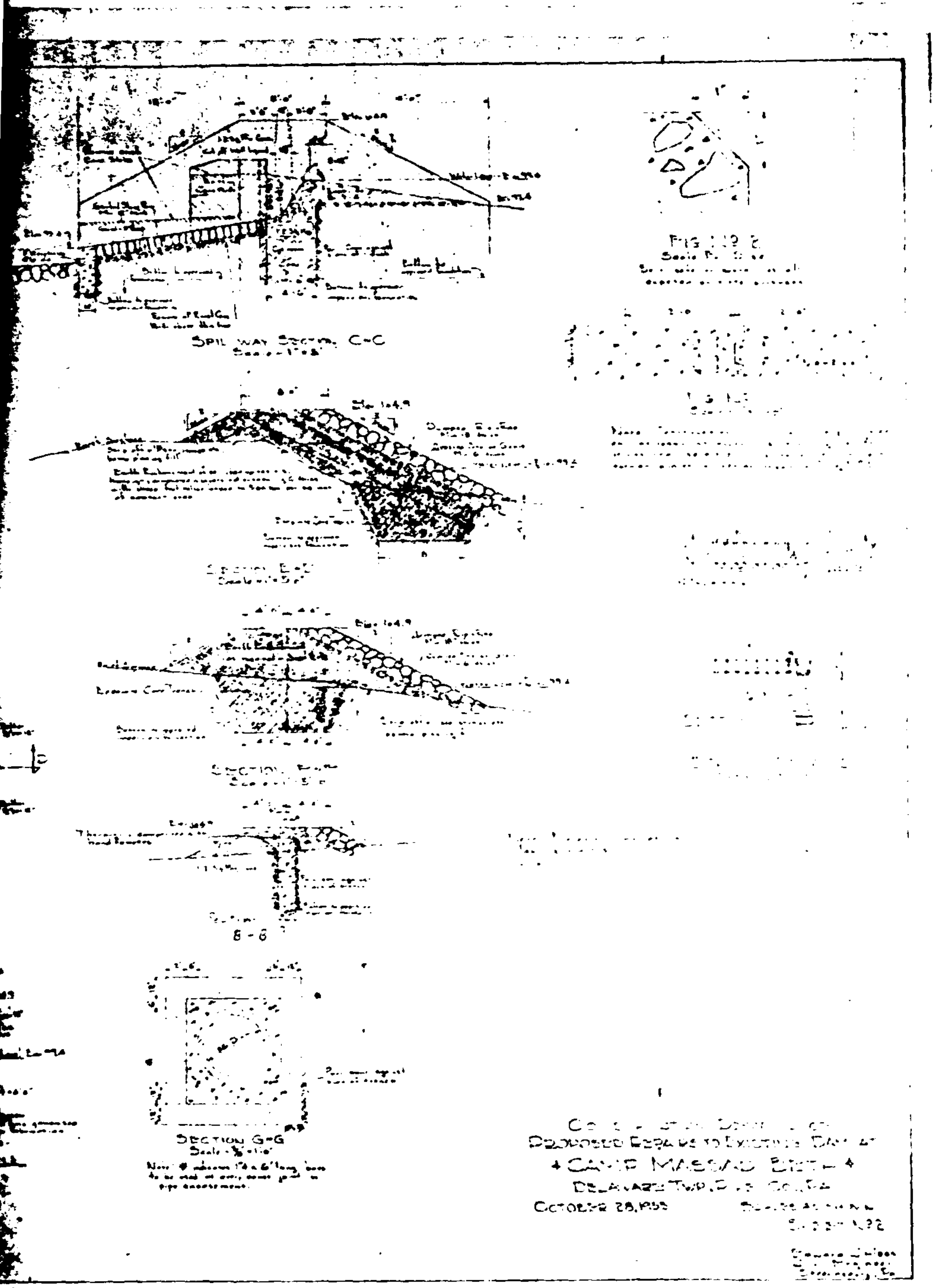

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FIGURE 3

APPENDIX F

GEOLOGY

Geology

Beaver Pond Dam is located in the glaciated Low Plateaus section of the Appalachian Plateaus physiographic province of eastern Pennsylvania. In this area, the Appalachian Plateaus province is characterized topographically by flat-topped, hummocky hills formed as a result of glaciation and subsequent stream dissection of nearly flat-lying strata. The Devonian age sedimentary rock strata in Pike County regionally strike N35°E and dip gently to the northwest. The Delaware River is the major drainage basin in the area. Major tributary streams intersect the Delaware River at right angles; whereas, smaller streams display a slightly more random tributary pattern. Both major and minor tributary stream systems are joint controlled and exhibit modified rectangular and trellis-type drainage patterns.

Structurally, the area containing Pike County lies on the south flank of a broad, asymmetrical synclinorium that plunges to the southwest. Superimposed on this broad structural basin are numerous anticlinal and synclinal folds characterized by planar limbs and narrow hinges. Due to prior glaciation, low relief and surficial soil cover, fold axes are difficult to trace.

The sedimentary rock sequences in the vicinity of the dam and reservoir are probably members of the Susquehanna Group of Upper Devonian age (see Geology Map). The sedimentological changes observed in the Catskill Formation indicate that the rate of sedimentation exceeded the rate of basin subsidence resulting in a facies change from marine to non-marine strata. On the accompanying geology map the delineation between the Middle and Upper Devonian age sedimentary rock sequences represents the Allegheny Front which separates the Valley and Ridge physiographic province from the Appalachian Plateaus physiographic province.

Approximately half of Pike County, including the dam site, is covered by a blanket of Wisconsin age (most recent) glacial drift which, based on the degree of weathering, was probably deposited during the Woodfordian stage. Valley bottoms are typically covered by recent alluvium and Woodfordian outwash of variable thickness, but typically less than 10 feet. These deposits are characteristically unconsolidated stratified sand and gravel usually with more gravel than sand and some small boulders. The direction of the Wisconsin ice advance, was from the northeast over the Catskill Mountains and from the north over the Appalachian Plateau. The terminal moraine resulting from the southern most advance of the Wisconsin ice sheet in this area is located in the southern portion of Monroe County which borders Pike County to the South.

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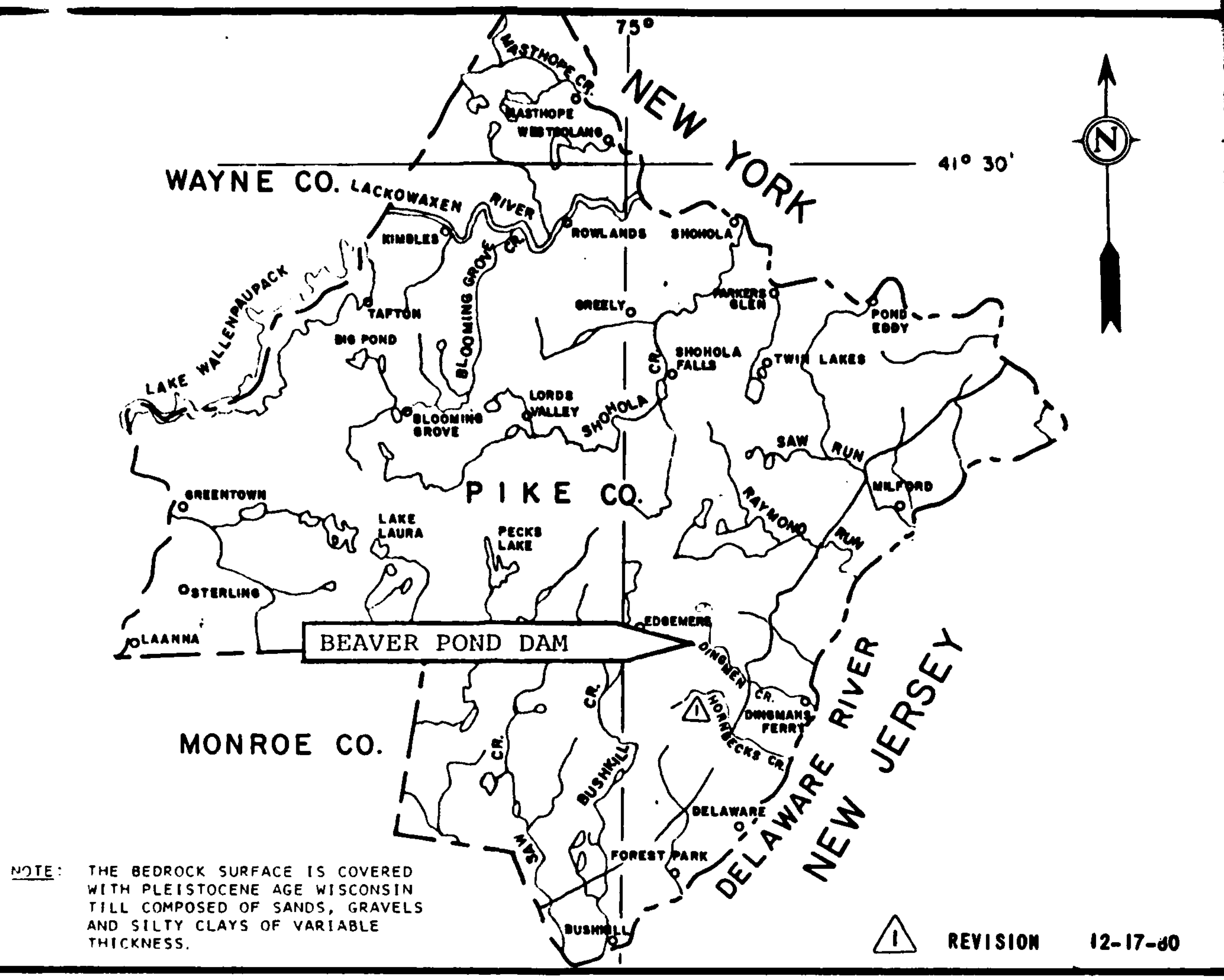

LEGEND

UPPER DEVONIAN — SUSQUEHANNA GROUP

Catskill Formation - *Shohola Member interbedded 5- to 25-foot thick units of greenish-gray and grayish-red very fine to medium-grained sandstone and sandy shale and lesser medium-gray to medium-dark-gray sandstone and shale. Sandstones are predominantly low-rank graywackes. Beds are thin to very thick and most have simple or planar sets of small- to medium-scale, generally low-angle cross stratification. Contacts with shale units are abruptly disconformable to gradational. Sandstones are poorly cleaved. Shale is thinly laminated and well cleaved. Mud cracks, convolute bedding, and sole marks are present near contacts with sandstone units. Member is more than 2,000 feet thick. Lower contact is gradational and is placed at top of highest red bed of the underlying Analomink. Analomink Red Shale Member, medium-grayish red silty, micaceous, finely laminated well-cleaved shale containing thin beds of brownish-gray sandy siltstone and silty very fine grained sandstone. Unit is the "first red" going up section in Upper Devonian sequence. member is about 100 feet thick. Lower contact is gradational and is placed at the base of lowest red bed Delaware River Flags Member, grayish-green, micaceous, laminated sandstone and lesser interbedded sandy shale. Beds range from a few inches to as much as 4 feet thick. Sandstones are low-rank graywackes and contain no marine fossils. Member is about 300 feet thick. Lower contact is gradational.*

MIDDLE DEVONIAN — HAMILTON GROUP

Mahantango Formation - *Upper member medium-dark-gray, fairly coarse grained, thin-bedded siltstone and silty shale; member is about 700 feet thick and is separated from lower member by the "Centerfield Reef," a calcareous siltstone biostrome containing abundant horn corals. The Centerfield is about 25 feet thick, lower member, virtually same lithology as upper member. Unit is about 1,100 feet thick. Lower contact is gradational.*

Marcellus Shale - *Dark-gray, evenly laminated, silty clay shale and clayey silt shale Unit commonly contains very hard limy concretions and is well cleaved; bedding is generally obscured. Member is about 75-feet thick. Lower contact is gradational.*

SCALE

0 6 12 18 MILES

REFERENCE
GEOLOGIC MAP OF NORTHEASTERN PENNSYLVANIA. COMPILED BY GEO. W. STOSE AND O.A. LJUNGSTEDT COMMONWEALTH OF PENNSYLVANIA DEPT. OF INTERNAL AFFAIRS DATED 1932, SCALE 1" = 6 MILES.

GEOLOGY MAP

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